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Farmington Field Office Oil and Gas Lease Sale, December 2018

Environmental Assessment

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Location:

McKinley, Rio Arriba, San Juan, and Sandoval Counties, New Mexico

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ABBREVIATIONS AND ACRONYMS

ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
APD	Application for Permit to Drill
ARPA	Archaeological Resources Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice

CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
COA	Condition of Approval
CSU	Controlled Surface Use
dB	Decibel
dBA	A-Weighted Decibel
EA	Environmental Assessment
EOI	Expression of Interest
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FFO	Farmington Field Office
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
Hz	Hertz
Mcf	Million Cubic Feet
MLA	Mineral Leasing Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NELM	Naked Eye Limiting Magnitude
NHPA	National Historic Preservation Act
NM	New Mexico
NMCRIS	New Mexico Cultural Resources Information System
NMED	New Mexico Environment Department
NMOC	New Mexico Oil Conservation Division
NMOSE	New Mexico Office of the State Engineer
NO ₂	Nitrogen Dioxide
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NSO	No Surface Occupancy
NTL	Notice to Lessee
NTUA	Navajo Tribal Utility Authority
O ₃	Ozone
Pb	Lead
PM	Particulate Matter
ppb	Parts Per Billion
ppm	Parts Per Million
RFD	Reasonably Foreseeable Development
RFFA	Reasonably Foreseeable Future Action
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROW	Right-of-Way
SHPO	State Historic Preservation Officer
SO ₂	Sulfur Dioxide

SQI	Scenic Quality Index
TCP	Traditional Cultural Property
TDS	Total Dissolved Solids
THPO	Tribal Historic Preservation Officer
TL	Timing Limitation
USCB	US Census Bureau
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VOC	Volatile Organic Compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WO	Washington Office
WQCC	Water Quality Control Commission

CHAPTER 1. INTRODUCTION

1.1. Background

This Environmental Assessment (EA) documents the Bureau of Land Management (BLM) Farmington Field Office (FFO) review of 13 parcels (5,830.810 acres) nominated for auction in the FFO December 6, 2018, Competitive Oil and Gas Lease Sale. This EA assesses the conformance of the proposed leasing with the approved land use plan, identifies and substantiates a rationale for deferring or dropping specific parcels, if any, from the lease sale, and determines the need for and character of additional stipulations to be attached to specific lease parcels.

The BLM decides which public lands and minerals are open for leasing and under what terms and conditions during the land use planning process. In accord with a resource management plan (RMP) or amendment to an RMP (RMPA), lands can be deemed open to leasing under standard terms and conditions, closed to leasing, or open under special operating constraints identified as lease stipulations at the lease stage. Lease stipulations are used to mitigate potential impacts to resources. Surface management of non-BLM administered land overlaying Federal minerals is determined by the BLM in consultation with the appropriate surface management agency or the private surface owner.

It is the policy of the BLM to make mineral resources available for use and to encourage their orderly development to meet national, regional, and local needs. This policy is derived from various laws, including the Mineral Leasing Act of 1920 (MLA), as amended [30 USC. 181 et seq.], and the Federal Land Policy and Management Act of 1976 (FLPMA), as amended. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 (Sec. 5102(a)(b)(1)(A)) directs the BLM to conduct quarterly oil and gas sales in each state whenever eligible lands are available for leasing. The BLM New Mexico State Office (NMSO) conducts a quarterly competitive lease sale to offer available oil and gas lease parcels in New Mexico, Oklahoma, Texas, and Kansas.

Expressions of Interest (EOI) to nominate parcels for leasing by the BLM are submitted by the public (43 Code of Federal Regulations [CFR] 3203.10(a)) or are included by BLM (43 CFR 3203.10(e)). An EOI may be included by the BLM if drainage has been noted. Drainage is the uncompensated loss of hydrocarbons, inert gases, or geothermal resources from wells on adjacent non-jurisdictional lands or jurisdictional lands resulting in revenue losses to the Federal government. Regulations found at 43 CFR 3162.2-2 outline the BLM's authority to protect leased and unleased public domain, acquired, Indian, tribal, and allotted mineral interests from the loss of oil and gas or geothermal resources by drainage and the resulting loss of royalty revenues. If EOIs to nominate parcels for leasing are located on private (fee) lands, the BLM NMSO would contact any surface owners and notify them of the EOI and the proposed date for competitive bidding on the oil and gas rights.

From these EOIs, the BLM NMSO sends a draft parcel list to any BLM Field Office(s) in which parcels are located for review and processing. BLM Field Office staff then review the parcels to determine if they are in areas open to leasing, if new information has become available which might change any analysis conducted during the planning process, if appropriate consultations have been conducted, what appropriate lease stipulations should be included, and if there are special resource conditions of which potential bidders should be made aware. The BLM NMSO would provide any private (fee) surface owners relevant website addresses so the owners may be informed or obtain additional information related to the oil and gas leasing process, the imposition of any stipulations on a lease parcel, Federal and state regulations, and best management practices. In order to meet the requirements of the BLM Competitive Leases Handbook (H-3120-1), an appropriate document following National Environmental Policy Act (NEPA, 42 US Code 4321 et seq.) guidelines is initiated for the nominated parcels.

The final parcel list with stipulations and notices would then be made available through a Notice of Competitive Lease Sale (NCLS) 45 days before the auction is held, which starts the protest period (10 days). The final parcel list with stipulations and notices, an unsigned Finding of No Significant Impact (FONSI), and the NEPA document will be made available to the public on the BLM National Register for NEPA documents (ePlanning) at <https://eplanning.blm.gov> and the BLM New Mexico oil and gas leasing website at <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/new-mexico>. The protest period ends 10 days after the NCLS is posted. Any private (fee) surface owner may elect to protest the leasing of the minerals underlying their surface. The BLM NMSO would resolve any protests between the end of the protest period and the lease sale, whenever possible. If any changes are needed to the parcels or stipulations/notices, an erratum would be posted to the BLM website to notify the public of the change. If the protest is upheld, the BLM would return the payments received from the successful bidder for that parcel(s). On rare occasions, additional information obtained after the publication of the NCLS may result in deferral of certain parcels prior to the lease sale. If a parcel is not purchased at the lease sale by competitive bidding, it may still be leased within two years after the initial offering.

Oil and gas leases are issued for a 10-year period and continue for as long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, exclusive right to develop the leasehold reverts back to the Federal government and the lease can be reoffered in another sale. The lease purchaser would have the exclusive right to use as much of the leased mineral estate as is necessary to explore and drill for oil and gas, subject to the stipulations attached to the lease (43 CFR 3101.1-2).

Standard lease terms would apply and provide for reasonable measures to minimize adverse impacts to specific resource values, land uses, or users (Form 3100-11, Offer to Lease and Lease for Oil and Gas, US Department of the Interior (USDI), BLM, October 2008 or later edition). Standard terms and conditions and lease stipulations listed in the 2003 FFO RMP would also apply. In addition, lease notices developed through the parcel review and analysis process (as required by 43 CFR 3101.3) to address site specific concerns or new information not identified in the land use planning process would also apply. The Competitive Leasing Handbook (H-3120-1) requires that the WO-NHPA and WO-ESA-7 lease stipulations (Appendix C) be added to every lease.

The drilling of wells is not permitted until the lease owner or operator submits a complete Application for Permit to Drill (APD) package (Form 3160-3) following the requirements specified under Onshore Oil and Gas Orders listed in 43 CFR 3162, and the APD is approved. An APD would not be approved until site-specific NEPA analysis is conducted. Site specific mitigation measures and best management practices (BMPs) would be brought forth from the NEPA document and attached as conditions of approval (COAs) for each proposed exploration and development activity authorized on a lease. Examples of COAs and standard terms and conditions are provided in Appendix G of the 2003 Farmington PRMP/EIS. Each COA may vary in its detail according to site requirements and the findings of environmental and cultural surveys during the approval process. COAs may change over time to comply with changes in policy, laws, and regulations. Additional information regarding the BLM's oil and gas management program can be accessed online at: <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas>. Any stipulations attached to the standard lease form must be complied with before an APD may be approved. Following BLM approval of an APD, a lessee may produce oil and gas from the well in a manner approved by BLM in the APD or in subsequent sundry notices.

Operations must be conducted in a manner that avoid unnecessary or undue degradation of the environment and minimize adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, as well as other land uses or users. Compliance with valid,

nondiscretionary statutes and laws is a further obligation of the standard lease terms and would apply to all lands and operations that are part of the alternatives.

Examples of nondiscretionary actions include the BLM's requirements under Federal environmental protection laws, such as the Clean Water Act, Clean Air Act, Endangered Species Act (ESA), National Historic Preservation Act (NHPA; 54 USC 306108), and FLPMA, which are applicable to all actions on Federal lands even though they are not reflected in the oil and gas stipulations in the governing land use plans and would be applied to all potential leases regardless of their category.

1.2. Purpose and Need

The BLM's purpose is to respond to EOIs to lease Federal oil and gas resources through a competitive leasing process. The need of the action is established by the BLM's responsibility under the MLA, as amended, to promote the exploration and development of oil and gas on the public domain.

1.3. Decision to be Made

The BLM FFO will decide whether or not to lease the nominated parcels, and if so, under what terms and conditions.

1.4. BLM Land Use Plan Conformance and Relationship to Statutes, Regulations, and Other Plans

1.4.1. BLM Land Use Plan Conformance

1.4.1.1. 2003 Farmington RMP

The applicable land use plan for the proposed leasing is the 2003 Farmington RMP and Final Environmental Impact Statement (FEIS) with Record of Decision (BLM 2003), as amended. The 2003 Farmington RMP designated approximately 2.59 million acres of Federal minerals open for continued oil and gas development and leasing under standard terms and conditions. The 2003 Farmington RMP, along with the 2002 Biological Assessment, also describes specific stipulations that would be attached to new leases offered in certain areas. The action alternatives in this EA conform to fluid mineral leasing decisions in the RMP and are consistent with the RMP goals and objectives for natural and cultural resources.

The 2003 Farmington RMP identifies the potential stipulations that could be attached to split-estate tracts that are proposed for leasing and requires that all new leases and all re-issued expired leases include surface resource protection stipulations. Mandatory stipulations would be incorporated into each lease where those stipulations apply. In addition, the BLM may include optional stipulations where resource values exist that warrant special protection. These special stipulations could include lease notices (LN), seasonal timing limitations (TLS), no surface occupancy (NSO), and other controlled surface use (CSU) stipulations which are designed to minimize or alleviate potential impacts to special resource values.

Pursuant to 40 CFR 1508.28 and 1502.21, this EA tiers to and incorporates by reference the information and analysis contained in the 2003 Farmington RMP/FEIS Alternative D analysis of Oil and Gas Leasing and Development (pp 4-105 to 4-119). These pages include analysis of oil and gas leasing and development as it pertains to geology and minerals, soils, water resources, air quality, upland vegetation, riparian areas and wetlands, special status species, wildlife, rangeland, lands and access,

visual resources, cultural resources, paleontology, noise, social and economic conditions, and environmental justice.

BLM FFO biologists have reviewed the proposed leasing and determined it would comply with threatened and endangered species management guidelines outlined in the 2002 Biological Assessment for the 2003 Farmington RMP (Consultation #2-22-01-I-389). Subsequently, the yellow-billed cuckoo was listed as threatened with proposed Critical Habitat in 2014. The proposed leasing analysis in this EA would have a “no effect” determination for this species due to lack of nesting habitat within and adjacent to the nominated lease parcels. For Federally listed fish species, a separate “effects determination” would be made at a site-specific project level to insure that water used for drilling operations is permitted from existing legal sources (no new water depletions) and is in compliance with the ESA. Any new water depletion would likely require Section 7 consultation under the ESA. No further consultation with the US Fish and Wildlife Service (USFWS) is required at this stage.

1.4.1.2. *2014 FFO Visual Resources Management RMPA (VRM-RMPA)*

The 2003 Farmington RMP was amended to update visual resources management (VRM) within the FFO and established VRM classes across the FFO which apply to all nominated parcels on Federal land. VRM class designation guides potential visual impact mitigation strategies for new development.

1.4.2. Relationship to Statutes, Regulations, and Other Plans

FLPMA established guidelines to provide for the management, protection, development, and enhancement of public lands (PL 94-579). Section 103(e) of FLPMA defines public lands as any lands and interest in lands owned by the United States (US). For split-estate lands where the mineral estate is an interest owned by the US, the BLM has no authority over use of the surface by the surface owner; however, the BLM is required to declare how Federal mineral estate is managed in the RMP, including identification of all appropriate lease stipulations (43 CFR 3101.1 and 43 CFR 1601.0-7(b); BLM Manual Handbook 1601.09 and 1624-1).

The MLA establishes that deposits of oil and gas owned by the US are subject to disposition in the form and manner provided by the MLA under the rules and regulations prescribed by the Secretary of the Interior, where consistent with the FLPMA, the NEPA, as amended (PL 91-90, 42 USC 4321 et seq.), and other applicable laws, regulations, and policies.

Purchasers of oil and gas leases are required to comply with all applicable Federal, state, and local laws and regulations, including obtaining all necessary permits prior to any lease development activities.

Federal regulations and policies require the BLM to make its public land and resources available on the basis of the principle of multiple-use. At the same time, it is BLM policy to conserve special status species and their habitats, and to ensure that actions authorized by the BLM do not contribute to the need for the species to become listed as threatened or endangered by the USFWS.

Where no alternative agreement exists or where such agreements are inapplicable, Section 106 of the NHPA outlines a Federal agency’s requirements for consultation with the State Historic Preservation Officer (SHPO), Native American tribes, and other stakeholders regarding the assessment of potential effects to historic properties from proposed undertakings. Various other authorities, including the Archaeological Resources Protection Act (ARPA), American Indian Religious Freedom Act (AIRFA), and Executive Order (EO) 13007, form the foundation of BLM’s efforts to protect and actively manage cultural resources, including historic properties as well as sites of traditional cultural or religious significance that may or may not meet operating definitions of historic properties or archaeological resources.

In Section 1835 of the Energy Policy Act of 2005 (43 USC 15801), Congress directed the Secretary of the Interior to review current policies and practices with respect to management of Federal subsurface oil and gas development activities and their effects on the privately owned surface. The Split Estate Report, submitted in December 2006, documents the findings from consultation on the split estate issue with affected private surface owners, the oil and gas industry, and other interested parties.

In 2007, the Legislature of the State of New Mexico passed the Surface Owners Protection Act. This Act requires operators to provide the surface owner at least five business days' notice prior to initial entry upon the land for activities that do not disturb the surface; and at least 30 days' notice prior to conducting actual oil and gas operations. Included in this policy is the implementation of a Notice to Lessees (NTL), a requirement of lessees and operators of onshore Federal oil and gas leases within the State of New Mexico to provide the BLM with the names and addresses of the surface owners of those lands where the Federal Government is not the surface owner, not including lands where another Federal agency manages the surface.

The Ojo Encino Chapter of the Navajo Nation updated their land use plan in 2016 (Ojo Encino Chapter 2016). The updated land use plan incorporates a community assessment, community regional analysis, Ojo Encino Chapter lands overview, and Ojo Encino policies. Nominated lease parcel 091 is within an area designated as a priority to be transferred from BLM to tribal management, is noted as an area for potential expansion of the community, and is classified as an Environmentally Highly Sensitive Area (Ojo Encino Chapter 2016).

The Counselor Chapter of the Navajo Nation created a land use plan in 2002 (Counselor Chapter 2002). The land use plan for the Counselor Chapter includes a community assessment, infrastructure analysis, suitability analysis, and recommendations and implementation of the land use plan; and was developed to provide guidance for housing development and other community needs.

1.5. Scoping and Public Involvement

1.5.1. Internal Scoping

A BLM FFO interdisciplinary team conducted internal scoping to identify potentially affected resources and land uses by reviewing the leasing actions under the NEPA framework. An interdisciplinary team meeting was held on July 2, 2018.

During internal scoping, nominated parcels 105 (844.430 acres) and 106 (1,440.000 acres) were determined to be located within the Carracas Mesa Recreation/Wildlife Area. The 2003 Farmington RMP prescribes that the Carracas Mesa Recreation/Wildlife Area is closed to new oil and gas leasing, therefore, the leasing of these parcels for oil and gas development would require a land use plan amendment and is out of the scope of this analysis. Appendix A summarizes details for nominated lease parcels 105 and 106. Details of these parcels are no longer discussed in this EA.

1.5.2. External Scoping

A summary web page for the FFO December 6, 2018, Competitive Oil and Gas Lease Sale (<https://go.usa.gov/xUv9d>) was posted on the BLM's National NEPA Register website (<https://eplanning.blm.gov>). The nominated lease parcels were posted online for a two-week public scoping period from July 9-20, 2018. Public scoping was extended to July 27, 2018.

During public scoping, the BLM received approximately 3,169 form comment letters opposing the FFO December 6, 2018, Competitive Oil and Gas Lease Sale, as well as more detailed scoping comments

from several pueblos, Navajo Nation Chapter Houses, environmental groups, the National Trust for Historic Preservation, and private individuals. No external public scoping comments were received that were in favor of leasing the nominated lease parcels. Concerns and comments presented by the public, Pueblos, and tribes during scoping are summarized below, with similar concerns grouped together for brevity. BLM FFO responses to scoping comments are provided below in *italics*.

- Procedural (NEPA and other) Concerns:
 - Oil and gas leasing should be deferred until the Farmington Mancos-Gallup RMPA and EIS is complete so as to avoid limiting the decision space.
 - *The Proposed Action of offering the nominated lease parcels is supported by the designation of those lands as available for leasing under the 2003 Farmington RMP, which remains the land use plan in effect while the Farmington Mancos-Gallup RMPA and EIS is being prepared. The offering of the nominated lease parcels would not limit the decision space of the RMPA.*
 - The impacts are likely to be significant and should be analyzed through the EIS process.
 - *Impacts disclosed in this EA document do not show significance that would warrant the development of an EIS.*
 - Government-to-government consultation has been insufficient or ineffective, with poor to no communication of the public scoping period.
 - *Government-to-government consultation is an ongoing process. Details are described in Chapter 4 of this EA.*
 - Section 106 and tribal consultation have not been completed for the FFO March 2018 Competitive Oil and Gas Lease Sale.
 - *Section 106 and tribal consultation is ongoing for the FFO March 2018 Competitive Oil and Gas Lease Sale, however, consultation for the FFO December 2018 Competitive Oil and Gas Lease Sale is a separate undertaking.*
 - BLM must consider a range of alternatives, including deferring all parcels and offering parcels with constraints such as no surface occupancy stipulations.
 - *Alternative B (No Action Alternative) is a no leasing alternative. Lease notices, controlled surface use, and no surface occupancy stipulations for the nominated lease parcels analyzed in Alternative A (Proposed Action) are provided in Appendix A and described in Appendix C.*
 - Oil and gas development appears to have been prioritized over all other potential uses of public land, in violation of FLPMA.
 - *Development of oil and gas and other resources are not mutually exclusive within the BLM FFO, and is therefore not a violation of FLPMA.*
- Cultural Concerns:
 - The land around Chaco Canyon must be withdrawn from leasing or deferred in order to protect the archaeological and cultural resources; in particular, some of the nominated lease parcels (107-113) are close to the Great North Road and Great Houses associated with the Chacoan landscape and should be deferred until for further consultation.
 - *Section 106 and tribal consultation as well as a BLM cultural review is ongoing for the nominated parcels in the FFO December 2018 Competitive Oil and Gas Lease Sale which will document impacts to the features associated with the Chacoan landscape and is described in Chapter 4.*
 - Traditional cultural properties (TCP) and other cultural resources have not been adequately identified throughout the San Juan Basin. The BLM should instead collaborate closely with Pueblo and tribal experts to identify cultural resources before

offering parcels for lease/before approving APDs; inadequate Section 106 NHPA evaluation/consultation.

- *Section 106 and tribal consultation as well as a BLM cultural review is ongoing for the nominated parcels in the FFO December 2018 Competitive Oil and Gas Lease Sale which documents impacts to TCPs as described in Chapter 4.*
- Audio/visual impacts and degradation of night-sky quality around Chaco Canyon and the region have not been adequately analyzed.
 - *Analyzed in Issue 5 (Section 3.8).*
- The existing stipulation to avoid placement of oil and gas development sites near dwellings requires that the structure be inhabited, which does not adequately protect seasonally or irregularly-inhabited tribal dwellings. Oil and gas development is fragmenting tribal-owned surface lands, diminishing suitable locations for future tribal home sites.
 - *Application of stipulation F-44-NSO to occupied residences and the potential application of 43 CFR 3101.1-2 from any structure, where proposed oil and gas operations may be moved up to 200 meters, protects these dwelling from impacts as analyzed in Issue 3 (Section 3.6), Issue 4 (Section 3.7), and Issue 7 (Section 3.10). Nominated parcels in the FFO December 2018 Competitive Oil and Gas Lease Sale are not located on tribal-owned surface lands.*
- Diné traditional knowledge and sacred spaces are being lost through development of ancestral lands.
 - *Section 106 and tribal consultation as well as a BLM cultural review is ongoing for the nominated parcels in the FFO December 2018 Competitive Oil and Gas Lease Sale to document sacred areas and areas of tribal importance.*
- Socioeconomic Concerns:
 - Rural communities have been inappropriately lumped together with urban communities, leading to inadequate environmental-justice analysis.
 - *Analyzed in Issue 7 (Section 3.10).*
 - Insufficient consideration of how negative impacts from oil and gas development would damage cultural tourism and general, dispersed recreation in the region.
 - *Excluded for analysis as described in ELM-15 of Table 1.2.*
 - Insufficient analysis of impacts to subsistence gathering (firewood, hunting, etc.) by tribal members.
 - *Excluded for analysis as described in ELM-6 of Table 1.2.*
 - Current oil and gas revenue-sharing system is not equitable for tribal communities, particularly at the local level, and economic impacts are disproportionate to local communities.
 - *The current oil and gas revenue-sharing system is outside the scope of this EA. Disproportional impacts to local communities is analyzed in Issue 7 (Section 3.10).*
 - Roads and transportation systems have been negatively impacted from oil and gas and mining development in the region.
 - *Excluded for analysis as described in ELM-17 of Table 1.2.*
- Health and Other Environmental Concerns:
 - Family and community disruption and division, lost spiritual connections with land, and environmental health concerns with development.

- *Family and community disruption and lost spiritual connection is considered outside the scope of this EA. Impacts to human health and safety are excluded for analysis as described in ELM-18 of Table 1.2.*
- Leakage of volatile organic compounds (VOC) has not been adequately analyzed for potential contribution to regional smog and other health risks. Methane leaks have not been adequately analyzed for their potential global contribution to greenhouse gases (GHGs).
 - *GHG emissions from oil and gas production as well as downstream (end use) emissions of GHGs from oil and gas resources is analyzed in Issue 2 (Section 3.5). Data on the amount of potential methane and VOC leakage related to oil and gas infrastructure in the San Juan Basin is not available to analyze its potential contribution to regional smog and potential health risks.*
- Hydraulic fracturing may contaminate drinking water supplies or cause other environmental damage; impacts from horizontal drilling have not been fully analyzed. Impacts on water resources (e.g. quality, quantity, and groundwater) must be addressed.
 - *Analyzed in Issue 6 (Section 3.9).*
- The BLM has not adequately considered recent climate science and the impact of reasonably foreseeable development on climate change in this analysis. The BLM must consider the social cost of carbon.
 - *Analyzed in Issue 2 (Section 3.5).*
- The BLM must take a “hard look” at induced seismic risks.
 - *Excluded for analysis as described in ELM-8 of Table 1.2.*
- The BLM must include an analysis of human health and analyze impacts to human communities, cultural values, and environmental justice.
 - *Impacts to human health and safety are excluded for analysis as described in ELM-18 of Table 1.2. Environmental justice is analyzed in Issue 7 (Section 3.10).*

A 10 day Protest Period will be held October 22-31, 2018. The BLM FFO will resolve any protest between the end of the protest period and the lease sale, whenever possible. If any changes are needed to the parcels or stipulations/notices, an erratum would be posted to the BLM website to notify the public of the change.

1.5.3. Issues

The Council on Environmental Quality (CEQ) regulations state: “NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail” (40 CFR 1500.1(b)). 40 CFR 1500.4(g) directs that the scoping process should be used “not only to identify significant environmental issues deserving of study but also to deemphasize insignificant issues narrowing the scope of the EIS process accordingly.”

Issues identified for detailed analysis in this EA are summarized in Table 1.1 and were developed in accordance with guidelines set forth in the BLM NEPA Handbook (BLM 2008) using input from public and agency scoping. The impact indicators provided are used to describe the affected environment for each issue and measure the amount or degree of change in the issue for different alternatives in Chapter 3, Affected Environment and Environmental Impacts.

Table 1.1. Issues Identified for Detailed Analysis

ISSUE #	ISSUE STATEMENT	IMPACT INDICATOR
Issue 1	How would air quality (particularly with respect to National Ambient Air Quality Standards [NAAQS] and Volatile Organic Compounds [VOCs]) in the BLM FFO be affected by emissions generated as a result of the proposed leasing?	Emissions
Issue 2	How would the proposed leasing contribute to greenhouse gas (GHG) emissions and climate change?	Emissions
Issue 3	How would the proposed leasing impact visual resources, particularly near the Bisti/De-Na-Zin Wilderness and nearby residences and communities?	Degree of contrast
Issue 4	How would the proposed leasing contribute to noise impacts near the Bisti/De-Na-Zin Wilderness and surrounding communities?	Sound level
Issue 5	How would the proposed leasing impact dark skies within the San Juan Basin?	Dark sky viewing potential
Issue 6	How would the proposed leasing impact groundwater quality and quantity?	Amount of water used; proximity to water features including wells and springs
Issue 7	How would the proposed leasing impact nearby residences and communities relating to socioeconomic and environmental justice?	Degree of impact

1.5.4. Issues Considered and Eliminated from Further Analysis

The following resources or resource concerns were evaluated and determined to not occur in the areas within or adjacent to the nominated lease parcels or would not be affected by the proposed leasing: cultural, geologic, riparian, recreation, and wildlife focused Specially Designated Areas or Areas of Critical Environmental Concern; farmlands (prime or unique); geology and solid minerals; riparian areas, wetlands, and floodplains; Fossil Forest and Reese Canyon Research Natural Areas; Ah-shi-sle-pah Wilderness Study Area; and wild horses and burros.

The below table lists resource issues that were considered and a rationale for why they were eliminated from further analysis. These resource issues are not discussed in further detail in this EA.

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
ELM-1	How would potential oil and gas development on the nominated lease parcels contribute to the	The EA does not undertake an analysis of the social cost of carbon because: 1) it is not engaged in a rulemaking for which the protocol was originally developed; 2) the interagency working group, technical supporting documents, and associated guidance have been withdrawn; 3) NEPA does not require cost-benefit analysis; and 4) the full social benefits of coal-fired energy production have not

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
	social cost of carbon?	been monetized, and quantifying only the costs of GHG emissions but not the benefits would yield information that is both potentially inaccurate and not useful. See Appendix E for further explanation.
ELM-2	How would potential oil and gas development on the nominated lease parcels impact historic properties?	<p>According to preliminary analysis, the undertaking would have no adverse effect to historic properties, including known Traditional Cultural Properties (TCPs). However, analysis and consultation under the NHPA Section 106 process for the undertaking is still underway. The BLM FFO will consult with the New Mexico SHPO and the Navajo Nation THPO, in addition to consulting parties including tribes and pueblos responding affirmatively to initial requests for consultation.</p> <p>Should the Section 106 process determine that the undertaking would have adverse effects to historic properties and that these effects would not be sufficiently mitigated, additional NEPA review would be necessary to analyze and disclose such significant impacts. Due to the central role location-specific cultural resource inventories and other identification efforts play in impacts analysis, the final tier of impacts analysis would be deferred to the APD stage.</p> <p>Cultural resources affects in areas open to leasing within the BLM FFO were analyzed in the 2003 Farmington PRMP/FEIS (pg. 3-66 to 3-88; 4-116) and 2003 Farmington RMP (pg. 2-36 to 2-38; Appendix C-1).</p>
ELM-3	How would potential oil and gas development on the nominated lease parcels impact Native American religious concerns?	<p>Tribal consultation for the proposed leasing was initiated as described in Chapter 4. Nominated lease parcels are within the Ojo Encino, Counselor, Nageezi and Huerfano Chapter Houses of the Navajo Nation.</p> <p>Preliminary analysis shows three parcels (089, 108, and 110) overlap or are adjacent to culturally significant locations identified in previous ethnographic work. In addition, all parcels except 071 potentially fall within the soundscapes of 9 ethnographically-identified resources and the viewsheds of up to 75. Potential impacts to these locations would be the subject of further review, and, likely, of government to government consultation and/or NHPA Section 106 consultation with the Navajo Nation. The BLM FFO would report results of this review in tandem with the NHPA Section 106 review findings.</p> <p>Cultural resources affects in areas open to leasing within the BLM FFO were analyzed in the 2003 Farmington PRMP/FEIS (pg. 3-66 to 3-88; 4-116) and 2003 Farmington RMP (pg. 2-36 to 2-38; Appendix C-1).</p>
ELM-4	How would potential oil and	Most parcels are more than 20 miles from the OSNHT. A small portion of Parcel 71 is within three miles of the modeled viewshed of

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
	gas development on the nominated lease parcels impact the Old Spanish Trail (OSNHT)?	the OSNHT. Application of stipulation F-40-CSU would ensure the BLM FFO has the ability to fully avoid any substantial interference with the nature and purpose of the trail following site-specific analysis for individual related development projects. Due to the central role location-specific viewshed modeling plays in impacts analysis (see BLM Manual 6280 5.3 B.2.), further analysis is deferred to the APD stage.
ELM-5	How would potential oil and gas development on the nominated lease parcels impact fluid minerals and energy production?	<p>Depending on the success of oil and gas well drilling, non-renewable natural gas and/or oil would be extracted and delivered to market. Production of oil and/or gas on the nominated lease parcels would result in the irretrievable loss of these resources, as well as contribute money in the form of revenue from the lease sale and any future royalty payments to the State of New Mexico and United States.</p> <p>Environmental impacts of the RFD scenarios were analyzed and are documented in the EA. Oil and gas development from the nominated lease parcels would not exceed the level of activity predicted in the RFD. While conflicts could arise between oil and gas operations and other mineral operations, these could generally be mitigated under 43 CFR 3101.1-2, where proposed oil and gas operations may be moved up to 200 meters or delayed by 60 days and also under the standard lease terms where siting and design of facilities may be modified to protect other resources.</p>
ELM-6	How would potential oil and gas development on the nominated lease parcels impact forestry and fuelwood resources?	Parcel 071 contains forested areas including ponderosa pine, and parcels 108 and 109 contain areas of pinyon juniper woodland. Any activity that involves surface disturbance or direct resource impacts would be authorized through future NEPA analysis, on a case-by-case basis at the APD stage. Standard BLM FFO conditions of approval call for trees 3 inches or greater in diameter at ground level be cut to ground level and delimbed. Tree trunks and cut limbs would be stacked along future projects' access roads for wood gatherers or wood would be delivered to the appropriate Chapter House of the Navajo Nation.
ELM-7	How would potential oil and gas development on the nominated lease parcels impact fuels and fire management?	Vegetation disturbance from potential projects authorized after leasing could increase the amount of invasive plants, specifically cheatgrass (<i>Bromus tectorum</i>), that could lead to an increase in fire frequency. Implementing appropriate reclamation standards, the BLM FFO Bare Soils Reclamation Guidelines (BLM 2013), and following any Conditions of Approval specific to fire safety and preparedness would help prevent hazardous fuel loading and fire starts. Fuels and fire management are not anticipated to be impacted.

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
ELM-8	How would potential oil and gas development on the nominated lease parcels impact the potential for induced seismicity in the San Juan Basin?	Oil and gas development on the proposed lease parcels would likely increase the amount of produced water that would be injected into the subsurface environment. While induced seismicity has been linked to wastewater injection in various parts of the United States (National Research Council 2013), the San Juan Basin has not been associated with induced seismicity (Weingarten et al. 2015), and the overall risk of induced seismicity in the San Juan Basin is low.
ELM-9	How would potential oil and gas development on the nominated lease parcels impact lands, access, and realty?	<p>Oil and gas leasing is not expected to affect access to public lands. Leasing would be subject to all valid pre-existing rights. Any proposals for future projects within the oil and gas lease area would be reviewed on a site-specific basis when an application for a ROW is received by the BLM FFO. Off-lease ancillary facilities that cross public land may require separate authorizations. Coordination with the existing ROW holders and application of standard operating procedures, best management practices, and design features at the APD stage, would ensure protection of existing rights. The 2003 FFO RMP, GIS, and master title plats for the lease areas have been reviewed and determined there are three avoidance areas for the West Wide Energy Corridor (parcels 108, 109, and 110) and two avoidance areas for the Carracas Mesa ACEC that are closed to new oil and gas leasing (2003 FFO RMP/ROD, PG. C-109) (parcels 105 and 106).</p> <p>These were both analyzed in the FFO FEIS and require no further analysis. Incorporated by reference are the FFO RMP objectives and management actions (pp. 2-8 to 2-13).</p> <p>Parcel 89 is listed for disposal (2003 FFO RMP/ROD, PG. 2-9).</p>
ELM-10	How would potential oil and gas development on the nominated lease parcels impact the physical and biological integrity of soils?	A small amount of BLM FFO designated fragile badland soil is located within nominated Parcels 089, 110, and 113. Fragile soils in the lease parcels would be analyzed during the APD process and avoidance, minimization, or mitigation measures would be applied as appropriate. BMP's would be incorporated in the COAs of an approved APD to mitigate any impacts that may occur during the development of a lease.
ELM-11	How would potential oil and gas development on the nominated lease parcels	Upland vegetation exists on all parcels. Parcel 071 contains sagebrush grassland, ponderosa pine, and pinyon-juniper (most prevalent) vegetation communities. Parcels 089, 090, 091, and 113 contain sagebrush grassland (most prevalent), badland-rock-wash, greasewood, grassland, and pinyon-juniper vegetation communities.

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
	impact vegetation?	<p>Sagebrush grassland is found on all of Parcel 111, and Parcel 112 is both sagebrush grassland (most prevalent) and grassland.</p> <p>These vegetation communities provide soil cover, wildlife habitat, and livestock forage among other values to varying levels. Lease development on the nominated parcels involving surface disturbance would be evaluated through future NEPA analysis on a case-by-case basis at the APD stage.</p>
ELM-12	How would potential oil and gas development on the nominated lease parcels impact livestock grazing?	<p>All parcels are located within active BLM livestock grazing allotments. Vegetation communities in these allotments provide livestock forage to varying degrees, with the sagebrush grassland community primarily utilized. These allotments fall under Section 15 of the Taylor Grazing Act. Parcel 071 is located in the Woodfill Allotment (No. 06117) on private land. Parcels 089, 090, and 091 are located on the Star Lake Community Allotment (No. 06023). Parcels 111, 112, and 113 are located on the Carson-Gallegos Community Allotment (No. 06004). These two community allotments are currently managed by the Bureau of Indian Affairs Eastern Navajo Agency (BIA-ENA).</p> <p>Lease development on the nominated parcels involving vegetation removal and changes to forage conditions as well as alterations to existing range improvements would be evaluated through future NEPA analysis on a case-by-case basis at the APD stage. Potential livestock grazing impact analysis would be dependent on site-specific development proposal features and locations, as well as BMPs and COAs utilized to minimize impacts.</p>
ELM-13	How would potential oil and gas development on the nominated lease parcels impact the introduction and/or spread of noxious weeds and invasive plants?	<p>Invasive and noxious weeds invade disturbed sites. In the event noxious weeds are discovered at any time during the life of a project, treatment options identified during the site specific development at the APD stage would be developed. BMPs would be incorporated into the COAs of an approved APD.</p>
ELM-14	How would potential oil and gas development on the nominated lease parcels impact paleontological	<p>Nominated lease parcels 071, 089, 108, 109, and 113 are located in areas that contain rolling hills and badlands which could house paleontological features that are closer to the ground surface. Standard paleontological stipulations would apply to any site specific projects at the APD stage.</p> <p>Nominated lease parcel 089 is abuts the southern edge of the Torreon Fossil Fauna West ACEC. Steep cliffs and topography on the</p>

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
	resources and the Torreon Fossil Fauna West ACEC?	north side of parcel 089 limit development in that area. Controlled surface use stipulations F-9-CSU and F-46-CSU would be applied to limit impacts to paleontological features and to erosion and topography.
ELM-15	How would potential oil and gas development on the nominated lease parcels impact public recreation?	The proposed leasing would not restrict or degrade recreation opportunities because recreation is dispersed throughout the area. Impacts to the Bisti/De-Na-Zin Wilderness are analyzed in Issue 4 (Noise), Issue 3 (Visual Resources), and Issue 5 (Night Skies).
ELM-16	How would potential oil and gas development on the nominated lease parcels impact Lands with Wilderness Characteristics?	The nominated lease parcels are not located within or adjacent to an area noted as having Wilderness Characteristics. Parcels 089, 090, and 091 were inventoried for Lands with Wilderness Characteristics in 2016 but were determined not to be suitable.
ELM-17	How would potential oil and gas development on the nominated lease parcels impact traffic, travel, and travel management?	Oil and gas development would likely introduce new roads and additional traffic onto roads in the regions near the nominated lease parcels. Development of the nominated parcels would be evaluated through future NEPA analysis on a case-by-case basis at the APD stage when more site specific information would be available on the type of roads and potential traffic impacts. Options to utilize and upgrade existing roads would be analyzed for future projects to minimize impacts. Travel management in not expected to be impacted.
ELM-18	How would potential oil and gas development on the nominated lease parcels impact public health and safety?	The nominated lease parcels are generally located in remote areas with limited public visitation, however, many of the lease parcels are located nearby or are surrounded by Navajo residences or near small communities such as Ojo Encino, Nageezi, Counselor, and Huerfano among others. One or more residences generally exist within a mile of each parcel. Controlled use stipulation F-44-CSU would be utilized to reduce impacts to nearby residences and communities relating to drilling and production activities. Additional impacts to public health and safety would be analyzed during future development of the leases on a case-by-case basis when site-specific details would be known for a project.
ELM-19	How would potential oil and gas development	No hazardous or solid wastes would be produced as a part of the leasing process and it is unknown at this stage what could be

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
	on the nominated lease parcels impact waste including solid and hazardous materials?	produced on the nominated lease parcels if they are developed. Therefore wastes are not be analyzed in this EA.
ELM-20	How would potential oil and gas development on the nominated lease parcels impact watershed hydrology and surface water quality and quantity?	<p>The nominated lease parcels are located in areas with limited surface waters and topographic relief, with likely few water features that would be considered potentially jurisdictional waters of the United States subject to regulation by the U.S. Army Corps of Engineers. Development in these areas would likely not impact watershed hydrology.</p> <p>Impacts to hydrology and watershed health as well as surface water quality and quantity from increased erosion and deposition would be addressed by following the BLM FFO Bare Soil Reclamation Procedures (BLM 2013), best management practices, and any conditions of approval aimed at mitigating increased sedimentation during the construction of projects.</p>
ELM-21	How would potential oil and gas development on the nominated lease parcels impact water rights in the San Juan Basin?	Any future oil and gas development activity that involves water use would authorized through future NEPA analysis on a case-by-case basis at the APD stage. Water used for oil and gas development would need approval through the New Mexico Oil Conservation Division and New Mexico Office of the State Engineer.
ELM-22	How would potential oil and gas development on the nominated lease parcels impact threatened and endangered (T&E) species?	The proposed leasing would be in compliance with the 2003 RMP and associated biological assessment. No riparian habitat is located within the nominated lease parcels that could impact yellow-billed cuckoo habitat. See Section 1.4.1 for additional details regarding impacts and consultation for T&E species.
ELM-23	How would potential oil and gas development on the nominated lease parcels impact BLM Sensitive Species?	BLM Sensitive Species or their habitats could be located within the nominated lease parcels, however, no specific populations are known to occur. Biological evaluations would be conducted at site-specific project levels for any future actions within the lease parcels to further determine if impacts to BLM Sensitive Species would occur and if avoidance, minimization, or mitigation measures would be taken. F-41-LN is applied to all parcels as notice for the potential requirement of biological surveys. NM-1-LN is applied to parcels with potential to house BLM Sensitive Species.

Table 1.2. Issues Considered and Eliminated from Detailed Analysis

ISSUE #	ISSUE STATEMENT	RATIONALE FOR NOT FURTHER DISCUSSING IN EA
ELM-24	How would potential oil and gas development on the nominated lease parcels impact migratory birds?	Activities directly and indirectly related to potential oil and gas development of the nominated lease parcels have the potential to impact migratory birds and their habitat. All potential future actions on the proposed leases would be analyzed through NEPA analysis, and would follow BLM FFO migratory bird policy which could include development restraints during migration and nesting seasons as well as nest surveys.
ELM-25	How would potential oil and gas development on the nominated lease parcels impact wildlife, including game and non-game species?	The FFO contains populations of big game species including deer and elk, as well as a multitude of other non-game species. Activities directly and indirectly related to potential oil and gas development of the nominated lease parcels have the potential to impact wildlife. These impacts include loss of suitable forage, loss of suitable habitat, habitat fragmentation, and avoidance of infrastructure. Therefore, any activity that involves surface disturbance or direct resource impacts would have to be authorized through future NEPA analysis, on a case-by-case basis at the APD stage.

CHAPTER 2. ALTERNATIVES

2.1. Alternative A – Proposed Action

The Proposed Action would offer for lease eleven nominated parcels of Federal minerals administered by the BLM FFO, covering 3,546.470 acres. Surface ownership of the proposed eleven parcels includes one private parcel (160.000 acres) and ten BLM managed parcels (3,386.470 acres). The parcels recommended for leasing under the Proposed Action are summarized in Appendix A with their associated lease stipulations. Maps of the nominated lease parcels are provided in Appendix B. Descriptions of lease stipulations are provided in Appendix C.

The nominated lease parcels are generally located near the Eastern boundary of the Navajo Nation in an area known as the “checkerboard” because of mixed land ownership by the BLM, Navajo Nation (Tribal Trust and Indian Allotted), private owners, and the New Mexico State Lands Office. Parcel 071 is near the eastern boundary of the FFO that is predominately privately owned and abuts the Carson National Forest to the east.

Oil and natural gas resources within the nominated lease parcels could be developed within multiple formations, including the Fruitland coal, Mancos, Gallup, Mesaverde, and Pictured Cliffs. Potential wells could be drilled horizontally or vertically. Estimates of the number of oil and natural gas wells, as well as oil, natural gas, and water production volumes that could reasonably occur on these parcels were derived from the BLM FFO’s RFD scenario for the Farmington Mancos-Gallup Draft RMPA and EIS (Crocker and Glover 2018).

The nominated lease parcels occur in areas of low, medium, and high development potential as determined by Crocker and Glover (2018). Well densities delineated for each of these development potential categories were used to calculate the projected number of wells that could be drilled on the nominated lease parcels. For parcels where this method resulted in fractional values of less than one well per parcel (because of small parcel acreages and low anticipated well densities), the fractional

values were adjusted to one well per parcel to provide meaningful inputs to the oil, natural gas, and water production projections.

The production projections for the nominated lease parcels were derived from the estimated ultimate recoveries of oil, natural gas, and produced water volumes per well as determined by Crocker and Glover (2018) for San Juan Basin horizontal and vertical wells. Oil, natural gas, and water production projections for these parcels were calculated by multiplying each well's appropriate oil, natural gas, and produced water estimated ultimate recovery by the number of wells projected for the nominated lease parcels (calculated using the method described above).

Estimated ultimate recovery of oil, natural gas, and produced water, based on the type of well and geologic formation, are listed in Table 2.1.

Table 2.1. Estimated Ultimate Recoveries of Oil, Natural Gas, and Produced Water by Formation

WELLBORE DIRECTION	GEOLOGIC FORMATION	OIL PRODUCTION (BBL)	GAS PRODUCTION (MCF)	PRODUCED WATER PRODUCTION (BBL)
Vertical	Generalized	19,115	3,234,964	140,382
Horizontal	Mancos	125,678	1,244,285	69,537

The estimated number of wells and associated oil, natural gas, and water production for the nominated lease parcels are summarized in Table 2.2.

Table 2.2. Estimated Well Count and Production for the Nominated Lease Parcels

PARCEL	ACRES	VERTICAL WELLS	HORIZONTAL WELLS	TOTAL WELLS	OIL PRODUCTION (BBL)	GAS PRODUCTION (Mcf)	PRODUCED WATER PRODUCTION (BBL)
071	160	1	0	1	19,115	3,234,964	140,382
089	480	0	1	1	125,678	1,244,285	69,537
090	1,200.24	0	1	1	125,678	1,244,285	69,537
091	180	0	1	1	125,678	1,244,285	69,537
107	80	0	1	1	125,678	1,244,285	69,537
108	160	0	1	1	125,678	1,244,285	69,537
109	480	0	1	1	125,678	1,244,285	69,537
110	320	0	1	1	125,678	1,244,285	69,537
111	320	1	0	1	19,115	3,234,964	140,382
112	80.28	1	0	1	19,115	3,234,964	140,382
113	85.95	0	1	1	125,678	1,244,285	69,537
Total	3,546.47	3	8	11	1,062,769	19,659,167	977,445

It is unknown when, where, or to what extent any subsequent well sites, roads, and associated infrastructure would be proposed. Development of the nominated lease parcels under the Proposed Action could include the phases of implementation (pad construction, drilling of a well using a

conventional pit system or closed-loop system, hydraulically fracturing a well, potential flaring of gas, construction of new access roads or expansion of existing roads, installation of pipeline), production (vehicle traffic, hauling of produced fluids like oil or produced water, compression to move gas through pipeline systems, potential venting from storage tanks, regularly well monitoring, and work-over tasks for the life of the well), and well plugging and abandonment/reclamation (plugging of a well and reclamation of a well pad and any other associated disturbances including access roads and pipelines). See Appendix D for a more in depth description of the phases of oil and gas development.

Crocker and Glover (2018) developed a RFD scenario that estimated future surface disturbance from oil and gas activities for the of the BLM FFO's Farmington Mancos-Gallup Draft RMPA and EIS. Surface disturbance was estimated at 6.85 acres for new horizontal wells (twinned) and their corresponding access road and pipeline, and 4.35 acres for new vertical wells and their corresponding access road and pipeline (Crocker and Glover 2018). Assuming future development for the Proposed Action of three vertical wells and eight horizontal wells, approximately 67.85 acres of new disturbance is anticipated.

2.2. Alternative B – No Action Alternative

Under the No Action Alternative, the BLM FFO would not carry out the FFO December 6, 2018 Competitive Oil and Gas Lease Sale for the nominated parcels. There would be no subsequent reasonable foreseeable development of the nominated parcels owing to the lease action. The BLM would continue to manage this mineral estate under current management practices. Parcels would have the potential to be nominated again in a future oil and gas lease sale.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1. Introduction

This section describes the existing conditions relevant to the issues presented in Table 1.1 and discloses the potential direct, indirect, and cumulative impacts of the action alternatives on those issues. Cumulative actions incorporated into the analysis are described in Section 3.2, Cumulative Actions. This discussion precedes the issue analysis because past and present actions within the spatial and temporal scope of analysis of the issues are components of the affected environment. Likewise, reasonably foreseeable future actions (RFFAs) are enumerated here because these actions apply to the cumulative effects analyses for each issue below.

3.2. Cumulative Actions

As defined in 40 CFR 1508.7 (CEQ regulations for implementing NEPA), a cumulative impact is an impact on the environment that results from the incremental impact of the action when combined with the effects of past, present, and RFFAs, regardless of which agency (Federal or non-Federal) or person undertakes such other actions. Sections 3.2.1 and 3.2.2 summarize past, present, and RFFAs considered in the cumulative effects analysis associated with each issue.

3.2.1. Past and Present Actions

Oil and gas development, along with its associated road, pipeline, and energy infrastructure is the predominant past and present action within the spatial scope of analysis analyzed in detail in this EA. In addition to oil and gas development, regional surface disturbance includes grazing, vegetation treatments, mining, and housing and development on Navajo, other tribal, and privately held lands.

The San Juan Basin has been a producing oil and natural gas field since the early to middle 1900s. According to August 2017 well data from the IHS Energy Group, 37,307 wells have been drilled within the planning area of the BLM FFO's Farmington Mancos-Gallup Draft RMPA and EIS that is currently in development to examine the potential impacts from changing oil and gas development patterns (Crocker and Glover 2018; IHS Energy Group 2017). This planning area covers the majority of the BLM FFO within the San Juan Basin that has potential for fluid mineral development. Approximately 67% of the aforementioned wells are gas wells, 6% are oil wells, and 26% are wells that have been plugged and abandoned with reclamation work performed. Vertical natural gas wells have been the dominant drilling activity in the San Juan Basin, however, recent drilling has dropped significantly with the majority of new wells being horizontal oil wells. Crocker and Glover (2018) developed a RFD scenario that estimated existing long-term surface disturbance from oil and gas activities to be 56,500 acres across the BLM FFO planning area for the of the BLM FFO's Farmington Mancos-Gallup Draft RMPA and EIS. Surface disturbance after interim reclamation was estimated at 3.1 acres for existing horizontal wells (twinned) and their corresponding access road and pipeline, and 2.1 acres for existing vertical wells and their corresponding access road and pipeline (Crocker and Glover 2018).

Nominated lease parcels 071, 090, 109, 111, and 112 have had previous oil and gas development; wells drilled on these lease parcels have been plugged and abandoned and reclamation is in various stages of completeness. The Bisti Federal 33 #001 well, located on nominated lease parcel 111, has recently been reclaimed and does not yet have BLM approval for final abandonment. Although given approval for final abandonment, the Alexandra Ballard #001 well located on nominated lease parcel 112, has a concrete pump jack foundation, pipe riser, and gravel present on the former well pad location.

3.2.2. Reasonably Foreseeable Future Actions

As with past and present actions, oil and gas development is the predominant RFFA within each spatial scope of analysis. Levels and rates of oil and gas development in the foreseeable future (approximately 20 years) may fluctuate depending on commodity prices, technology, and other factors. Actions involving grazing, vegetation treatments, and housing and development are expected to occur at current levels and rates.

Table 3.1 summarizes development potential using the 2018 RFD scenario (Crocker and Glover 2018). A previous RFD scenario was developed in 2014 for the FFO (Engler et al. 2014).

Table 3.1. Summary of Development Potential Predicted in the 2018 RFD Scenario (Crocker and Glover 2018)

DEVELOPMENT POTENTIAL	ACRES IN PLANNING AREA	WELLS PER TOWNSHIP	TYPE OF DEVELOPMENT
Negligible	249,400	<1	Likely vertical
Low	1,810,000	4-8	Likely vertical
Medium	1,635,000	6-9	Likely horizontal
High	273,000	10+	Likely horizontal

The 2018 RFD scenario projects 3,200 new oil and gas wells to be drilled within the BLM FFO in the next 20 years (2018-2037), the majority of which (2,300) are predicted to be horizontally drilled. New surface disturbance from potential wells in this scenario is estimated to approximate 18,500 acres.

Parcels have been nominated for the BLM New Mexico's December 2018 lease sales for the Rio Puerco Field Office, Pecos District Office (Roswell and Carlsbad Field Offices), and Oklahoma Field Office. Thirty

parcels totaling 40,802.370 acres were nominated for lease in the Rio Puerco Field Office. These parcels are located directly adjacent to nominated lease parcels 089, 090, and 091 that are near the community of Ojo Encino.

3.3. Impacts of Alternative B - No Action Alternative for all Issues

A separate impact analysis section in each issue analyzed in this EA for Alternative B – No Action Alternative is not provided. Impacts from this alternative are summarized as follows. Under the No Action Alternative the EOs to lease (parcel nomination) would be deferred, and no parcels would be offered for lease during the FFO December 6, 2018 Competitive Oil and Gas Lease Sale.

Potential impacts associated with the Proposed Action would not occur under this alternative and current land and resource uses would continue. Oil and gas development would continue on leased land surrounding the nominated lease parcels. No natural gas or crude oil from the nominated lease parcels would be produced, and no royalties would accrue to Federal or State treasuries. Employment and revenue opportunities in local communities related to the oil and gas and service support industry could be lowered under this alternative.

3.4. Issue 1: How would air quality (particularly with respect to National Ambient Air Quality Standards [NAAQS] and volatile organic compounds [VOCs]) in the BLM FFO be affected by emissions generated as a result of the proposed leasing?

3.4.1. Affected Environment

Air quality and climate are components of air resources that may be affected by BLM authorized activities and resource management. This section summarizes technical information related to air resources associated with oil and gas development and the methodology and assumptions used for analysis. Much of the information referenced in this section is incorporated from the Air Resources Technical Report for BLM Oil and Gas Development in New Mexico, Kansas, Oklahoma, and Texas (herein referred to as Air Resources Technical Report; BLM 2017). Additional information on air quality within the FFO planning area is contained in Chapter 3 of the 2003 Farmington RMP/FEIS (BLM 2003).

The US Environmental Protection Agency (USEPA) has the primary responsibility for regulating air quality, including six nationally regulated ambient air pollutants of carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀ & PM_{2.5}), sulfur dioxide (SO₂), and lead (Pb). The USEPA has established NAAQS for criteria pollutants that are protective of human health and the environment. The USEPA has approved New Mexico's State Implementation Plan and the state enforces state and Federal air quality regulations on all public and private lands within the state except for tribal lands and lands within Bernalillo County.

The Air Resources Technical Report describes the types of data used when analyzing the existing conditions of criteria pollutants, how the criteria pollutants are related to the activities involved in oil and gas development, and provides a table of current national and state standards. The USEPA's Green Book web page reports that the FFO, including San Juan, Rio Arriba, Sandoval, and McKinley counties, is in attainment of all NAAQS as defined by the Clean Air Act (USEPA 2018a). The FFO is also in attainment of all state air quality standards (NMAAQs). Air quality can be measured and described in many different ways. This analysis uses design values, air quality indexes, and an existing emissions inventory of human-caused sources to evaluate air quality.

"Design Values" are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. The most recent design values for criteria pollutants within McKinley, Rio Arriba, Sandoval, and San Juan Counties are listed below in Table 3.2 (USEPA 2018b). These counties

do not have monitoring data for CO, Pb, and PM concentrations, but because the counties are relatively rural, it is likely that these pollutants are not elevated. Values for PM concentrations in counties within the FFO were not listed and it is assumed monitoring has been discontinued with approval from USEPA because the affecting sources have been shut down.

Table 3.2. Design Values for Counties within the FFO (USEPA 2018b)

POLLUTANT	2017 DESIGN CONCENTRATIONS	AVERAGING TIME	NAAQS	⁶ NMAAQS
O ₃	Rio Arriba County: 0.065 ppm Sandoval County: 0.065 ppm San Juan County: 2 stations at 0.064 ppm, 1 station at 0.068 ppm	8-hour	¹ 0.070 ppm	-
NO ₂	San Juan County: 1 station at 10 ppb, 1 station at 6 ppb, and 1 station at 1 ppb	Annual	² 53 ppb ²	50 ppb
NO ₂	San Juan County: 35 ppb	1-hour	³ 100 ppb	-
SO ₂	San Juan County: 2 ppb	1-hour	⁵ 75 ppb	-
PM _{2.5}	San Juan County: ^{3,4,6} 4.1 µg/m	Annual	^{3,4} 60 µg/m	^{3,4} 60 µg/m
PM _{2.5}	San Juan County: ^{3,4,6} 4.1 µg/m	24-hour	^{3,6} 35 µg/m	^{3,6} 150 µg/m
¹ Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years ² Not to be exceeded during the year ³ 98 th percentile, averaged over 3 years ⁴ Annual mean, average over 3 years ⁵ 99 th percentile of 1-hour daily maximum concentrations, averaged over 3 years ⁶ The last 3 year average was from 2013-2015				

While the FFO planning area is in attainment of all NAAQS, including ozone, the site at 423 Highway 539 near Navajo Dam in San Juan County is closely watched due to the current ozone design value of 0.068 ppm.

Air quality in a given region can also be measured by its Air Quality Index (AQI) value. The AQI is a national index, therefore the air quality rating and the associated level of health concern is the same throughout the country. The AQI is an important indicator for populations sensitive to air quality changes (USEPA 2018c). The AQI is reported according to a 500-point scale for each of the major criteria air pollutants, with the worst denominator determining the ranking. For example, if an area has a carbon monoxide (CO) value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. Values and categories of AQI are presented in Table 3.3.

Table 3.3. AQI Values and Categories

AQI VALUE	AQI Category
≤ 50	Good
51-100	Moderate
101-150	Unhealthy for sensitive groups
151-200	Unhealthy

Table 3.3. AQI Values and Categories

AQI VALUE	AQI Category
201-300	Very unhealthy

AQI values for San Juan County primarily occurred in the “good” category in 2017, with 63% of days having an AQI value less than 50. The median AQI in 2017 was 47. The maximum AQI, from 2015, was 115 which is in the “unhealthy for sensitive groups” category, and the 90th percentile was 67 which is in the “moderate” air quality category (USEPA 2018c).

AQI values for Sandoval County primarily occurred in the “good” category in 2017, with 74% of days having an AQI value less than 50 and 26% of days occurring in the “moderate” air quality range. The median AQI in 2017 was 44. The maximum AQI, from 2015, was 97 which is in the “moderate” category, and the 90th percentile was 58 which is also in the “moderate” air quality category (USEPA 2018c).

AQI values for Rio Arriba County primarily occurred in the “good” category in 2017, with 75% of days having an AQI value less than 50 and 24% of days occurring in the “moderate” air quality range. The median AQI in 2017 was 45. The maximum AQI, in 2015, was 90 which is in the “moderate” category, and the 90th percentile was 58 which is also in the “moderate” air quality category (USEPA 2018c).

The USEPA does not have air quality data for McKinley County.

Table 3.4 lists the days where AQI values were “unhealthy for sensitive groups” or worse since 2006. While there are some exceedances, the exceedances do not represent a trend of degrading AQI values.

Table 3.4. Number of Days Classified as “Unhealthy for Sensitive Groups” or worse (AQI >100; USEPA 2018c)

COUNTY / YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Rio Arriba	0	0	0	0	0	0	0	2	0	0	0	3
Sandoval	17	6	0	0	0	0	0	0	0	0	0	1
San Juan	24	45	3	0	13	18	12	6	0	2	2	6

Total human caused emissions within the San Juan Basin are reported in Table 3.5 based on USEPA’s 2014 emissions inventory in tons per year (USEPA 2014). The bulk of estimated total emissions are from electricity generation via combustion (49.5%) and gas plant activities (31%). Emissions are a result of the following actions:

- Electricity generation is fuel combustion from electric utilities;
- Fossil fuel combustion is fuel combustion from industrial boilers, internal combustion engines, and commercial/institutional or residential use;
- Industrial processes include manufacturing of chemicals, metals, and electronics, storage and transfer operations, pulp and paper production, cement manufacturing, petroleum refineries, and oil and gas production;
- On-road vehicles category includes both gasoline- and diesel-powered vehicles for on-road use;
- Non-road equipment includes gasoline- and diesel-powered equipment for non-road use, as well as planes, trains, and ships; and
- Road dust includes dust from both paved and unpaved roads. Presentation of emissions data by source sector provides a better understanding of the activities that contribute to criteria pollutant emissions.

Table 3.5. Human Caused Emissions Estimates from the FFO in tons/year (USEPA 2014)

COUNTY	¹ NOx	² CO	³ VOC	^{4, 7} PM10	^{5, 7} PM2.5	^{6, 7} SO2
McKinley	11,208	12,761	3,114	48,409	5,542	843
Rio Arriba	11,704	28,244	30,347	23,609	3,336	80
Sandoval	5,946	20,865	6,617	28,246	3,584	139
San Juan	40,493	50,339	38,278	52,556	6,621	5,232
Total	69,351	112,209	78,356	152,820	19,083	6,294
¹ NOx - nitrogen oxides ² CO - carbon monoxide ³ VOC - volatile organic compounds ⁴ PM10 - particulate matter with an aerodynamic diameter equal to or less than 10 microns ⁵ PM2.5 - particulate matter with an aerodynamic diameter equal to or less than 2.5 microns ⁶ SO2 - sulfur dioxide ⁷ Values derived from average emissions for any well drilling in the analysis area. Calculated results available upon request.						

3.4.2. Environmental Impacts

3.4.2.1. *Impacts of the Proposed Action*

The methodology and assumptions for calculating air pollutant emissions are described in the Air Resources Technical Report (BLM 2017). This document incorporates the sections discussing the use of calculators developed by the BLM to address emissions for one well. The calculators give an approximation of criteria pollutants and hazardous air pollutant emissions and GHGs to be compared to regional and national levels. Also incorporated into this document are the sections describing the assumptions that the FFO used in developing the inputs for the calculator (BLM 2017).

Potential impacts to air quality from the sale of the nominated lease parcels would occur if the leases are developed. Impacts to air quality could occur from VOCs emitted during drilling, completion, and production of hydraulically fractured wells; increased airborne soil particles from new construction of well pads and roads; fugitive dust from operations and maintenance (PM10); and exhaust emissions (CO, NOx, and VOCs) from drilling equipment, compressor engines, dehydration and separation facilities, vehicles, and venting and flaring.

To reasonably quantify emissions associated with well exploration and production activities, certain types of information are needed including the types of equipment needed if a well were to be completed successfully (e.g. compressor, separator, dehydrator); technologies which may be employed by a given company for drilling any new wells; area of disturbance for each type of activity (e.g. roads, well pads, electric lines, compressor station); number of days to complete each kind of construction; number of days for each phase of drilling process; type, size, and number of heavy equipment used for each type of construction (backhoe, dozer, etc.); number of wells of all types (shallow, deep, exploratory, etc.); compression per well (sales, field booster); and average horsepower for each type of compressor.

There are three phases in the development of a well that result in different levels of emissions. The first phase occurs during the first year of development and may include pad construction, drilling, completion, interim reclamation, and operation of the completed well. The first year results in the highest level of emissions due to the equipment required during the construction and drilling, and the potential release of natural gas to the atmosphere during completion.

The second phase begins after the well is completed and is put on line for production. Emissions during the production phase may include vehicle traffic, engines to pump oil if necessary, compressor engines to move gas through a pipeline, venting from storage tanks, and storage tank heaters. A workover of the well may occasionally be required, but the frequency of workovers is not predictable since they result from mechanical difficulties of the well bore.

The final phase is to plug and abandon the well and reclaim the well pad and other associated disturbances (e.g. access roads and pipelines). The life of the well is unknown and emission estimates for this phase are not presented.

The degree of impact may also vary according to the characteristics of the geologic formations from which production occurs. Currently, it is not feasible to directly quantify emissions, however, the potential development scenarios that could result from selection of the Proposed Action are analyzed in the calculators developed in the Air Resources Technical Report (BLM 2017). The Air Resources Technical Report provides an estimated emissions calculator for development of a single oil or gas well. Different assumptions are made for various well development scenarios, and emissions are estimated for criteria pollutants and hazardous air pollutants based on past development knowledge, practices, and resource concerns specific to each parcel (BLM 2017).

Exploration and production of the nominated lease parcels would contribute to incremental increases in overall air quality emissions associated with oil and gas exploration and production into the atmosphere. The most significant criteria pollutants emitted by oil and gas development and production are VOCs, particulate matter, and NO₂. VOCs and NO₂ contribute to the formation of ozone, which is the pollutant of most concern to the FFO. The additional NO₂ and VOCs emitted from any oil and gas development on these leases are likely too small to have a significant effect on the overall ozone levels of the area and are not expected to impact the current design values within the FFO.

3.4.3. Mitigation Measures

The BLM requires industry to incorporate and implement BMPs, which are designed to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Typical measures include adherence to BLM's NTL-4A concerning the venting and flaring of gas on Federal leases for natural gas emissions that cannot be economically recovered, flaring hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion, watering dirt roads during periods of high use to reduce fugitive dust emissions, collocating wells and production facilities to reduce new surface disturbance, implementing directional and horizontal drilling and completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores, suggestions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored, and performing interim reclamation to revegetate areas not required for production facilities and reduce the amount of fugitive dust.

In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is administered by the USEPA. The Natural Gas STAR program is a flexible, voluntary partnership that encourages oil and natural gas companies to adopt proven, cost effective technologies and practices that improve operational efficiency and reduce natural gas emissions. The USEPA has promulgated air

quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs during gas well completions.

3.4.4. Residual and Cumulative Impacts

Future development of the nominated lease parcels could contribute to increases in air quality emissions. Additional oil and gas development is likely to occur on existing leases which would also contribute to increases in emissions in the FFO which could negatively impact air quality.

3.5. Issue 2: How would the proposed leasing contribute to greenhouse gas (GHG) emissions and climate change?

3.5.1. Affected Environment

Information about GHGs, their relationship to climate change, and their effects on national and global climate is presented in the Air Resources Technical Report (BLM 2017). Potential effects from GHG emissions would occur from any oil and gas development of the nominated lease parcels.

Climate change is a statistically-significant and long-term change in climate patterns. The terms climate change and “global warming”, though often used interchangeably, are not the same. Climate change is any deviation from the average climate via warming or cooling, and can result from both natural and human (anthropogenic) sources. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early-twentieth century and is primarily attributed to human activities such as fossil fuel combustion, industrial processes, and land use changes.

The natural greenhouse effect is critical to the discussion of climate change. The greenhouse effect refers to the process by which GHGs in the atmosphere absorb heat energy radiated by earth’s surface. Water vapor is the most abundant GHG, followed by carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and several other trace gases. These GHGs trap heat that would otherwise be radiated into space, causing earth’s atmosphere to warm and making temperatures suitable for life on earth. Water vapor is often excluded from the discussion of GHGs and climate change since its atmospheric concentration is largely dependent upon temperature rather than emissions by specific sources.

The two primary GHGs associated with the oil and gas industry are CO₂ and CH₄. Because CH₄ has a global warming potential that is 21 to 28 times greater than the warming potential of CO₂, the USEPA uses measures of CO₂ equivalent (CO₂e) which take the difference in warming potential into account for reporting GHG emissions (BLM 2017). Emissions are expressed in metric tons of CO₂e in this document. Oil and gas field production activities do not significantly contribute to N₂O levels and is therefore not included in estimating potential direct emissions in this EA.

3.5.1.1. Methodology and Assumptions

Uncertainties regarding the potential development of the nominated lease parcels includes the number of future wells and other factors specific to the type of well which result in a moderate to high degree of uncertainty and speculation with regard to GHG estimates at the leasing stage. At the APD stage, more site-specific information on oil and gas activities resulting in GHG impacts would be described in detail.

The BLM does not direct or regulate the end use of produced oil and/or gas. End uses of hydrocarbons extracted from the potential development of the nominated lease parcels could include the combustion of transportation fuels, fuel oils for heating and electricity generation, the production of asphalt and road oil, and the manufacturing of chemicals, plastics, and other synthetic materials. The BLM can only

provide an estimate of potential GHG emissions using national approximations of where or how the end use may occur.

To establish the exact number of wells in the San Juan Basin is problematic due to the ongoing development of new wells, the abandonment of unproductive wells, land sales and exchanges, and incomplete or inaccurate databases. To determine the most transparent and publicly accessible method of estimating the number of active federal wells in the New Mexico portion of the San Juan Basin, BLM utilized geographic information systems data and the New Mexico Oil Conservation Division's (NMOCD) Oil and Natural Gas Administration and Revenue Database (ONGARD; NMOCD 2015). An ONGARD search was conducted for all active, new, and temporarily abandoned federal wells in New Mexico in 2015; 16,289 wells were found in the San Juan Basin and 17,798 wells were found in the Permian Basin.

3.5.1.2. *Oil and Natural Gas Production and Emissions Estimates*

There is uncertainty with estimating GHG emissions during the production stage of oil and gas development, however some level of estimation can be provided using a top-down approach with various assumptions. This approach provides a level of comparison for GHG emissions associated with oil and gas production managed by the BLM to total oil and gas production emissions of the United States as well as to total emissions of all GHGs for the United States. To estimate the contribution of Federal oil and gas leases to GHG emissions in New Mexico, it is assumed that the percentage of total U.S. production is comparable to the percentage of total U.S. emissions. Therefore, emissions were estimated from the U.S. Energy Information Administration (USEIA) based on total oil (USEIA 2018a) and gas (USEIA 2018b) production for the US and total GHG emissions for the US (USEPA 2018d), and applying production percentages to estimate emissions for the San Juan Basin of New Mexico. The below table shows oil and gas production and estimated GHG emissions for the U.S., New Mexico, and the major federal oil and gas mineral estates of New Mexico. The estimated average annual GHG emissions per federal well in the San Juan Basin is 139.4 metric tons of CO₂e.

Table 3.6. 2016 Oil and Gas Production (USEIA 2018a, USEIA 2018b) and Estimated GHG Emissions (USEPA 2018d)

LOCATION	OIL (BBL)	% OF U.S. TOTAL	GAS (MMCF)	% OF U.S. TOTAL	ANNUAL GHG EMISSIONS (METRIC TONS CO ₂ E)	% OF U.S. GHG EMISSIONS
United States	3,232,025,000	100	32,635,511	100	164,400,000	100
New Mexico	146,389,000	4.5	1,284,698	3.9	6,794,108	4.1
Federal minerals in New Mexico	70,010,962	2.2	788,776	2.4	3,837,013	2.3
¹ San Juan Basin	7,057,510	0.2	638,342	2.0	2,270,359	1.4
² Permian Basin	138,508,606	4.3	587,988	1.8	4,313,166	2.6
¹ Includes McKinley, Rio Arriba, Sandoval, and San Juan Counties						
² Includes Chaves, Eddy, Lea, and Roosevelt Counties						

3.5.2. Environmental Impacts

3.5.2.1. *Impacts of the Proposed Action*

Impacts to GHG emissions from the Proposed Action include direct emissions from the development and construction of any potential wells on the nominated lease parcels and indirect (downstream/end use) emissions from the consumption of oil and natural gas products.

Direct GHG emissions of the Proposed Action are calculated assuming full development of the nominated lease parcels (11 oil and natural gas wells). Using the average annual oil and gas production emission value of 139.4 metric tons CO₂e per well in the San Juan Basin and multiplying by 11 wells yields an estimate of 1,533.4 metric tons CO₂e of annual direct GHG emissions from the Proposed Action. This represents an increase of 0.001% of the total annual GHG emissions from oil and gas production in the United States and an increase of 0.02% of the total annual GHG emissions from oil and gas production in New Mexico.

Potential indirect (downstream/end use) GHG emissions from the Proposed Action are estimated using oil and gas production values summarized in Table 2.2 (1,062,769 bbl of oil and 19,659,167 Mcf of natural gas). The challenge for estimating indirect emissions comes with understanding how oil and gas would be distributed and used for energy. Because this information is not typically available, an alternate method of calculating indirect GHG emissions based on estimated production data was developed for this analysis.

GHG combustion emission factors and global warming potentials were applied and converted to units of metric tons/Mcf and metric tons/bbl and finally metric tons of CO₂e. GHG combustion emission factors and global warming potentials for natural gas and petroleum were obtained from 40 CFR Part 98, Subparts A and C. GHG indirect emissions from oil production are estimated to be higher than indirect emissions from natural gas production due to the higher carbon dioxide emission factor for oil. Table 3.7 estimates indirect GHG emission contributions for the Proposed Action using the USEPA's GHG equivalencies calculator (USEPA 2018d).

Table 3.7. Estimated Indirect (Downstream/End Use) GHG Emissions (USEPA 2018d)

PRODUCT	ESTIMATED PRODUCT QUANTITY	EMISSIONS FACTOR	Estimated Emissions (metric tons CO ₂ e)
Crude Oil (bbl)	1,062,769	0.43 metric ton CO ₂ /bbl	456,990.7
Natural Gas (Mcf)	19,659,167	0.055 metric ton CO ₂ /Mcf	1,081,254.2
Total	-	-	1,538,244.9

3.5.3. Mitigation Measures

The BLM requires industry to incorporate and implement BMPs, which are designed to reduce impacts to air quality, and subsequently GHGs, by reducing emissions from field production and operations. Typical measures include adherence to BLM's NTL-4A concerning the venting and flaring of gas on Federal leases for natural gas emissions that cannot be economically recovered, flaring hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion, implementing directional and horizontal drilling and completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores, and suggestions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored.

In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is administered by the USEPA. The Natural Gas STAR program is a flexible, voluntary partnership that encourages oil and natural gas companies to adopt proven, cost effective technologies and practices that improve operational efficiency and reduce natural gas emissions.

3.5.4. Residual and Cumulative Impacts

Cumulative impacts of GHG emissions and their relationship to climate change are evaluated at the national and global levels in the Air Resources Technical Report (BLM 2017). Future development of the nominated lease parcels would contribute to increases in GHG emissions through both direct and indirect pathways. Additional contributions to GHG emissions would be through oil and gas development on existing leases, electricity generation, mining, and vehicle travel among other sources.

The increase in direct and indirect GHG emissions that could result from development of the nominated lease parcels would not produce climate change impacts that significantly differ from It is unknown when, where, or to what extent any subsequent well sites, roads, and associated infrastructure would be proposed. Development of the nominated lease parcels under the Proposed Action could include the phases of implementation (pad construction, drilling of a well using a conventional pit system or closed-loop system, hydraulically fracturing a well, potential flaring of gas, construction of new access roads or expansion of existing roads, installation of pipeline), production (vehicle traffic, hauling of produced fluids like oil or produced water, compression to move gas through pipeline systems, potential venting from storage tanks, regularly well monitoring, and work-over tasks for the life of the well), and well plugging and abandonment/reclamation (plugging of a well and reclamation of a well pad and any other associated disturbances including access roads and pipelines). See Appendix D for a more in depth description of the phases of oil and gas development.

Crocker and Glover (2018) developed a RFD scenario that estimated future surface disturbance from oil and gas activities for the of the BLM FFO's Farmington Mancos-Gallup Draft RMPA and EIS. Surface disturbance was estimated at 6.85 acres for new horizontal wells (twinned) and their corresponding access road and pipeline, and 4.35 acres for new vertical wells and their corresponding access road and pipeline (Crocker and Glover 2018). Assuming future development for the Proposed Action of three vertical wells and eight horizontal wells, approximately 67.85 acres of new disturbance is anticipated.

Alternative B – No Action Alternative. This is because climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the Proposed Action cannot be translated into effects on climate change globally or in the area of this site-specific action because it is currently not feasible to predict the net impacts on global or regional climate with certainty.

3.6. Issue 3: How would the proposed leasing impact visual resources, particularly near the Bisti/De-Na-Zin Wilderness and nearby residences and communities??

3.6.1. Affected Environment

The BLM uses a VRM system to inventory and manage visual resources on public lands. The primary objective of VRM is to manage visual resources so that the quality of scenic (visual) values is protected. A visual resource inventory (VRI) was performed in 2009 and lands within the FFO were assigned a VRI class based on scenic quality, sensitivity, and distance zones. Based on this VRI the VRM-RMPA was completed in 2014 which established VRM classes across the FFO.

VRM and VRI designations are split into four classes (Class I-Class IV) that represent the relative value of the visual resources. Lower classes are the most restrictive and the most highly valued landscapes.

VRI Class I areas are assigned to special management areas and may include Wilderness Areas, Wilderness Study Areas, or other congressionally designated areas. Additional details about VRM may be found in Manual 8400 (Visual Resource Management) and VRI may be found in Manual H-8410-1 (Visual Resource Inventory).

Nominated lease parcel 071 is on private (fee) surface and is not subject to BLM VRI and VRM designations. All of the remaining parcels are designated as VRI and VRM Class IV areas. Parcels 108, 109, and 110 also have areas of VRM Class III designation. Parcels 111, 112, and 113 are located next to the Bisti/De-Na-Zin Wilderness which is designated as a VRI VRM Class I area. The objective of a VRM Class I area is to preserve the existing character of the landscape and manage for natural ecological change. Management goals for the Bisti/De-Na-Zin Wilderness are to preserve the natural character, solitude, and primitive recreation opportunities, and to preserve and protect the important scientific and educational resource values (BLM 2003).

The characteristic landscape of nominated lease parcels 090, 091, 107, 110, 111, and 112 is that of a flat to rolling sagebrush grassland. Nominated lease parcels 089, 108, 109, and 113 are also comprised of flat to rolling sagebrush grasslands but also include rolling badland hills vegetated with pinyon-juniper woodlands. Banded badland and sandstone cliffs are located on the north side of parcel 089, and parcel 071 is a mix of meadow and rangeland surrounded by pinyon juniper woodlands and some ponderosa pine trees. Roads, pipelines, residences, and transmission lines are common near all nominated lease parcels, and oil and gas operations and equipment surround parcels 111, 112, and 113. Parcels 089, 090, and 091 are located near the community of Ojo Encino.

3.6.2. Environmental Impacts

3.6.2.1. *Impacts of the Proposed Action*

Impacts to visual resources from the development of the nominated lease parcels could occur through the removal and/or alternation of the existing landscape and vegetation during project construction, as well as the placement of project related above-ground facilities. Short-term visual impacts could include the addition of equipment, drilling rigs, and vehicles to the landscape as well as the clearing of vegetation and alteration of the ground surface during construction. After construction and drilling, project areas not needed for operations would be recontoured and revegetated during interim reclamation. Long-term visual impacts could include aboveground equipment and facilities as well as the working area of projects needed for long-term operations, maintenance, and access. Long-term impacts would remain for the life of the project, and would cause visible contrast to form, line, color, and texture of the natural landscape.

Oil and gas development on parcels 111, 112, and to a lesser extent 113 would be congruent with viewer expectation, as these parcels are located in an area of oil and gas development. Development on these parcels would potentially be visible from the Bisti/De-Na-Zin Wilderness and could affect visual resources from locations within the wilderness. This development could attract attention and impact the solitude and natural character of the Bisti/De-Na-Zin Wilderness. Oil and gas development on parcels 089, 090, 091, 107, 108, 109, and 110 would introduce new oil and gas features onto landscapes that are generally devoid of industrial activity, however, previous oil and gas development has occurred in the general region of these parcels generally around the 1970s and 1980s.

3.6.3. Mitigation Measures

Lease stipulations F-8-VRM and/or F-7-VRM would be applied to all nominated lease parcels except parcel 071 to protect visual resources. Visual resource mitigations such as using low profile tanks, vegetation screening, equipment orientation and shielding, applying an appropriate BLM designated

color scheme, and potential site relocation could be used at the site specific level to mitigate impacts to local residences and places of visual importance. Visual contrast ratings may also be completed at the site specific level from key observation points to determine impacts to visual resources. Lease stipulation F-34-VRM would be applied to nominated lease parcels 111, 112, and 113 to reduce visual impacts to the Bisti/De-Na-Zin Wilderness.

3.6.4. Residual and Cumulative Impacts

The addition of new roads, infrastructure, and facilities from oil and gas development on the nominated lease parcels would contribute to an increase in the industrial feel of the visual landscape. These visual impacts would remain for the lifetime of any projects developed on the nominated lease parcels.

3.7. Issue 4: How would the proposed leasing contribute to noise impacts near the Bisti/De-Na-Zin Wilderness and surrounding communities?

3.7.1. Affected Environment

Noise may be defined as an unwanted or annoying sound associated with human activity that interferes with the natural environment or disrupts normal activities (Bureau of Reclamation 2008). Response to noise varies and is influenced by the type of noise or activity, time of day, appropriateness of the noise in its physical setting, and sensitivity of the individual. Noise from oil and gas compressors has been identified as an issue of primary concern within the FFO. The A-weighted decibel scale is thought to best fit the frequency or loudness response of the human ear and is used by the Occupational Safety and Health Administration for its noise standards.

BLM FFO noise policy NTL 04–2 FFO (BLM 2004) was developed to limit noise in the FFO from oil and gas activities, and specified noise standards and noise sensitive areas (NSAs; e.g. visitor use areas, wilderness, recreational areas, raptor nesting/roosting sites, sensitive habitat, and sites where people live and work) for the BLM FFO. Noise standards of 48.6 dBA (A-weighted decibels) over a continuous 24-hour period were developed for NSAs, and were classified as either boundary focused or receptor focused. Noise standards are required to be met at the boundary of a boundary focused NSA or within 100 feet of a receptor focused NSA.

Current noise levels within the FFO vary and include noises associated with traffic, construction, drilling and completion from oil and gas and mining operations, traffic from highways and roads, and noise associated with residential and city areas. Ambient sound levels in the FFO may vary depending on proximity to noise emitting sources, roadways, topography, vegetation, and weather conditions including temperature, wind, and humidity. Existing noise levels near the nominated lease parcels are generally low with the dominant noise sources coming from adjacent oil and gas operations, traffic on nearby roads, residences, grazing operations, and the hum of transmission lines.

Management goals for the Bisti/De-Na-Zin Wilderness are to preserve the natural character, solitude, and primitive recreation opportunities, and to preserve and protect the important scientific and educational resource values (BLM 2003). The wilderness character of the Bisti/De-Na-Zin Wilderness Area includes its many opportunities for primitive recreation in a setting of unusual and visually aesthetic geological formations.

3.7.2. Environmental Impacts

3.7.2.1. *Impacts of the Proposed Action*

All of the nominated lease parcels are within one mile or less of occupied residences. Parcels 091, 107, 108, and 110 have residences within 500 feet of the lease parcel. One residence structure is located within parcel 108 and another residence is located 50 feet from the southern boundary of parcel 108. Lease parcels 111, 112, and 113 are 1.0, 1.5, and 0.0 miles north, respectively, of the Bisti/De-Na-Zin Wilderness which is a BLM FFO designated boundary focused NSA.

Noise impacts associated with any development of the nominated lease parcels would be moderate to high during the construction, drilling, completion, or workover phases of any new wells, after which noise levels would be low and consistent during production and operation due to compressors or other long-term sound sources. While long-term operating noises under NTL 04-2 FFO (BLM 2004) would require noise to be kept at or below 48.6 decibels, this value is an averaged value and louder noises could occur as long as the overall 24-hour sound average was less than 48.6 decibels. 48.6 decibels is akin to the loudness of a conversation, and would be noticeable in an otherwise quiet environment such as those near the nominated lease parcels. Impacts from low frequency noise may also occur, however, these impacts are less well known and not typically regulated.

Wilderness values can be degraded if human activities impair the pristine qualities and naturalness of the wilderness setting. Oil and gas infrastructure and operations from nominated lease parcels 111, 112, and especially 113 could generate noise that intrudes on the natural qualities and sense of solitude within the northern portion of the Bisti/De-Na-Zin Wilderness.

3.7.3. Mitigation Measures

Noise from oil and gas equipment that operates on a continuous (more than 8 hours/day on a long-term basis, which is more than 1 week in duration) would be kept at or below 48.6 dBA at the boundary of the Bisti/De-Na-Zin Wilderness Area to minimize disturbances to those within the wilderness and could be held to stricter standards if necessary as described in NTL 04-2 FFO (BLM 2004). Lease Notice F-35-LN would be applied to nominated lease parcels 111, 112, and 113 to reduce noise impacts to the Bisti/De-Na-Zin Wilderness.

Lease stipulation F-44-NSO would apply, and designate that no surface occupancy is allowed within 660 feet of any occupied residences of a community to reduce impacts to the community from drilling and production activities. Noise would be kept at or below 48.6 dBA within 100 feet of all occupied residences surrounding the nominated lease parcels as described in NTL 04-2 FFO (BLM 2004).

Additional noise mitigation measures such as mufflers, sound barriers, or project relocation may be developed at the site specific level to mitigate additional impacts from noise. Operators on the nominated lease parcels shall comply with all applicable Federal, state, and local rules and regulations for reduction of noise from their operations.

3.7.4. Residual and Cumulative Impacts

Existing noise levels generated by area roads and existing oil and gas infrastructure are anticipated to increase from any new oil and gas development on the nominated lease parcels. These noise impacts would remain for the lifetime of any projects developed on the nominated lease parcels.

3.8. Issue 5: How would the proposed leasing impact dark skies within the San Juan Basin?

3.8.1. Affected Environment

Dark skies within the BLM FFO have been recognized as important for stargazing and astrophotography, as well as being significant both culturally and spiritually. Of particular importance for dark sky management in the FFO are the Bisti/De-Na-Zin Wilderness and CCNHP.

Both the Bisti/De-Na-Zin Wilderness and CCNHP provide spectacular opportunities for dark sky viewing. CCNHP was designated as an International Dark Sky Park in 2013 and offers interpretive astronomy programs and stargazing at the Chaco Observatory. While there is limited night sky monitoring data available in the region, the National Park Service (NPS) has collected night sky data from monitoring stations above the north rim of Chaco Canyon within CCNHP (Gallo Cuesta and Pueblo Alto) in 2013 and 2014 (NPS 2018).

Sources of light pollution can be from direct sources of light or sky glow. The Sky Quality Index (SQI) is an index of light pollution from sky glow with a range of 0 to 100, where 100 is a sky free from artificial sky glow. The SQI for the Gallo Cuesta monitoring station within CCNHP was 92.4 in 2013 and the SQI for the Pueblo Alto monitoring station was 82.8 in 2014 (NPS 2018). These values represent skies that retain their natural characteristics throughout most of the sky. Another measure is the Naked Eye Limiting Magnitude (NELM), which is a measure of the faintest stars that can be observed with the naked eye at the darkest part of the sky. The NELM values for both monitoring stations were 7.1, which is between excellent (7.4) and good (7.0). NELM values under 6.3 typically indicate significantly degraded sky quality (NPS 2018). Sky glow was noted to occur from surrounding cities including Farmington, Gallup, Crownpoint, and Albuquerque; as well as from drilling rigs and gas flaring to the north of Chaco Culture National Historical Park (2013 Gallo Cuesta monitoring report; NPS 2018). Overall, dark sky conditions within the region are good to excellent under current conditions.

3.8.2. Environmental Impacts

3.8.2.1. *Impacts of the Proposed Action*

Potential oil and gas development of the nominated lease parcels would result primarily in temporary impacts to dark skies and the stargazing potential of the general region. These impacts would occur from lights used during construction and drilling including lights around the working area, lights on the drilling rig (which may include lights on the derrick), and vehicle lights; and from flaring if it occurs during completion activities of potential wells. Night lighting could be used during the 24-hour construction days during drilling, and could last up to two to three weeks per well.

Lighting from nominated lease parcels 111, 112, and 113 could be directly visible from the Bisti/De-Na-Zin Wilderness depending on distance and topography between a potential well and the wilderness, particularly Parcel 113 which directly abuts the wilderness. Lighting from nominated lease parcels 89, 90, and 91 would also likely be visible to residents of Ojo Encino, NM, and lighting from nominated lease parcel 71 could be visible to residents of Lindrith, NM. Lighting from the nominated lease parcels would be directly visible to many of the residences surrounding the nominated lease parcels. Located approximately 4.4 to 6.0 miles northeast of the Chacoan outlier of Pueblo Pintado (managed by the NPS), lighting from parcels 107, 108, 109, and 110 could also potentially be visible, however this would depend on distance and topography between Pueblo Pintado and any proposed development location.

Overall sky glow would likely increase slightly from any nighttime lighting or flaring that occurs on the lease parcels. Sky glow impacts would be greater to the Bisti/De-Na-Zin Wilderness from parcels 111, 112, and 113; and CCNHP from parcels 107, 108, 109, and 110 due to distance.

Leasing of the nominated parcels is not anticipated to result in major changes to the SQI or NELM ratings at CCNHP, however, these ratings could decrease while light sources are present on the landscape from any development of the nominated lease parcels. Distance and topography are assumed to shield the majority of project related illumination impacts to CCNHP.

3.8.3. Mitigation Measures

Mitigation measures would be developed at the site specific level to lessen impacts to dark skies from sources of illumination. Lights would be shielded or turned to the ground whenever possible, and flaring would be limited to days and times necessary for project completion to mitigate impacts from light pollution. The necessity and duration for flaring varies from well to well and depends on the type of well drilled and the method of completion. During operations, lighting would be limited to only that needed to conduct work safely.

3.8.4. Residual and Cumulative Impacts

Although temporary in nature for a single well, potential long-term light impacts from construction and flaring could remain perpetually on the landscape if drilling occurs continuously on the nominated lease parcels and in the surrounding region.

3.9. Issue 6: How would the proposed leasing impact groundwater quality and quantity?

3.9.1. Affected Environment

3.9.1.1. *Groundwater in the San Juan Basin*

Water used for oil and gas development within the San Juan Basin is typically obtained from groundwater sources due to the arid climate of the region. Aquifers in the San Juan Basin are generally considered to be confined and artesian due to the overlying low hydraulic conductivity formations and the regional geologic structure, however, unconfined aquifers may be found at shallower depths (Stone et al. 1983). The New Mexico Bureau of Geology and Mineral Resources (NMBGMR) have defined the primary confined aquifers in the San Juan Basin to include the Ojo Alamo Sandstone, Kirtland Shale/Fruitland Formation, Pictured Cliffs Sandstone, Cliff House Sandstone, Menefee Formation, Point Lookout Sandstone, Gallup Sandstone, Dakota Sandstone, Morrison Formation, and Entrada Sandstone (Kelley et al. 2014). Groundwater is available in most of the FFO and is typically of poor to fair quality (Stone et al. 1983).

Using data from the New Mexico Office of the State Engineer's (NMOSE) online WATERS database, there are over 6,600 active and inactive points of diversion within the Animas and San Juan River Basins with an average depth of 394 feet (NMOSE 2017). A summary of the points of diversion from the NMOSE's WATERS database (NMOSE 2017) within a three mile radius surrounding the nominated lease parcels is provided in the table below. Analysis of the well data shows that groundwater is available in the area of the nominated lease parcels, especially near parcel 071, and may be found at shallow depths. A livestock well shows to be declared within parcel 071 in the NMOSE's WATERS database, however, it does not appear to have been drilled. Groundwater wells used by the community of Ojo Encino are located within a half mile of Parcel 091.

Table 3.8. Points of Diversion Within a Three Mile Radius of the Nominated lease parcels

PARCEL(S)	TOTAL POINTS OF DIVERSION	POINT OF DIVERSION STATUS	AVERAGE DEPTH (FEET)	AVERAGE DEPTH TO WATER (FEET)	POINT OF DIVERSION USE (NUMBER)
071	58	Null (33) Active (17) Pending (8)	547	286	Domestic (14) Livestock (4)
089, 090, 091	6	Null (2) Active (2) Pending (2)	¹ 710	¹ 306	Domestic (2) Livestock (2) Mining (1)
107, 108, 109, 110	8	Null (3) Active (3) Pending (2)	334	120	Domestic (1) Livestock (2) Sanitary / Commercial (1)
111, 112, 113	5	Null (4) Active (1)	² 2,550	N/A	Oil and Gas (1) Irrigation (1)
¹ The values of average depth and average depth to water are heightened due to one well that is 2,238 feet deep and has a depth to water of 769 feet. With this well excluded, average depth would be 328 feet and average depth to water would be 152 feet.					
² Only one well reported well depth					

Multiple springs/seeps are located within a three mile radius of the nominated lease parcels using data from the national hydrography dataset (US Geological Survey 2013). The “Ojo Encino” spring/seep is located approximately 534 feet (0.1 mile) from the eastern edge of Parcel 091, the “Ojo Sandoval Spring” spring/seep is located approximately 0.6 mile from Parcel 109, and an unnamed spring/seep is located approximately 0.4 mile from Parcel 108 and 0.6 mile from Parcel 110.

Residences surrounding the nominated lease parcels and the community of Ojo Encino are dependent on local water wells, water hauling, or may be supplied water from the Navajo Tribal Utility Authority (NTUA). Approximately 94% of houses in Ojo Encino are connected to the NTUA water system, and the Menefee and Mesa Verde water bearing aquifers were identified by the Chapter as deep and shallow groundwater sources (Ojo Encino 2016). The Navajo-Gallup Water Supply Project is scheduled to begin construction in 2018 to deliver water to the general region of Ojo Encino (Bureau of Reclamation 2018).

3.9.1.2. *Water Used in Oil and Gas Operations*

Groundwater rights held by the oil and gas industry in the San Juan Basin were estimated to be 6,674 acre-feet per year, or approximately 6.3% of the total allocated rights in 2014. Mining (31.1%), domestic and municipal use (28.2%), and food production/irrigation (24.7%) were the major sources of allocated water use within the San Juan Basin (Kelley et al. 2014). Water use by the oil and gas industry from both surface and groundwater sources was estimated to be approximately 2,244 acre-feet across New Mexico in water year 2010. Estimated water use from both surface and groundwater sources for McKinley, Rio Arriba, Sandoval, and San Juan Counties in water year 2010 was 659,597 acre-feet (Longworth et al. 2013).

Water used for drilling and well completion varies by the type and depth of a particular well. Kelley et al. (2014) estimated that recent horizontally drilled wells within the Mancos/Gallup formations of the San Juan basin used approximately 1,020,000 gallons of water on average per well for drilling and completion (3.1 acre-feet). Vertical wells were estimated to use approximately 105,000 gallons (0.3 acre-

feet) for Dakota wells, 150,000 gallons (0.5 acre-feet) for Mesaverde group wells, and 207,000 gallons (0.6 acre-feet) for Gallup wells (Kelley et al. 2014). The 2018 RFD scenario estimated that water use for hydraulic fracturing of potential wells for the next 20 years would be 60 million barrels (2.5 billion gallons or 7,683 acre-feet; Crocker and Glover 2018). If more water intensive stimulation methods (e.g. slickwater fracturing) are implemented or if laterals become longer, water use could increase from estimates by Crocker and Glover (2018). Alternatively, water use estimates by Crocker and Glover (2018) could be lowered if produced water is reused or recycled for use in hydraulic fracturing.

Stimulation (i.e., hydraulic fracturing or “fracking”) is a process used to maximize the extraction of hydrocarbons from reservoir rock formations to a well bore by allowing oil and/or natural gas to move more freely from rock pore spaces to production well piping that brings oil and/or gas to the surface. Stimulation techniques have been used in the United States since the 1940s (USEPA 2016b), in the San Juan Basin since the 1950s, and are used in almost all new wells nationwide. Over the last 10 years, advances in multi-stage and multi-zone hydraulic fracturing have allowed development of gas fields that were previously uneconomic.

Fracturing and other well-stimulation techniques vary across the San Juan Basin depending on company preference, source water quality, site specific characteristics of the target geological formations, and the type of well. Water and sand typically make up 98% to 99% of the composition of fracking fluid, with chemical additives comprising the remaining 1% to 2% (USEPA 2004, Groundwater Protection Council 2009, USEPA 2016b). Chemicals added to fracking fluids may include friction reducers, surfactants, gelling agents, scale inhibitors, acids, corrosion inhibitors, antibacterial agents, and clay stabilizers (GWCP 2009). Nitrogen may be used in place of water for some fracking operations.

The New Mexico Oil Conservation Division (NMOCD) regulates state oil and gas operations in New Mexico. The NMOCD has the responsibility to gather oil and gas production data, permit new wells, establish pool rules and oil and gas allowables, issue discharge permits, enforce rules and regulations of the division, monitor underground injection wells, and ensure that abandoned wells are properly plugged and the land is responsibly restored. The New Mexico Environment Department (NMED) administers the major environmental protection laws. The Water Quality Control Commission (WQCC), which is administratively attached to the NMED, assigns responsibility for administering its regulations to constituent agencies, including the NMOCD. The NMOCD administers, through delegation by the WQCC, all Water Quality Act regulations pertaining to surface and groundwater (except sewage not present in a combined waste stream).

The oil and gas producing zones of the proposed oil and gas lease sale parcels could vary from shallower coalbed methane reserves to deeper oil and gas reserves located in sandstones and siltstones that are encased or surrounded both horizontally and vertically by the Mancos Shale interval.

Coalbed methane reserves are typically at shallower depths (less than 2,000 feet below the ground surface) throughout the San Juan Basin. Development of coalbed methane resources is dependent upon the removal of water within the Fruitland formation to reduce pressure and allow methane molecules to detach from the surrounding coal matrix. Coalbed methane formation water is at times pumped for livestock use. The Kirtland Shale is a confining layer that overlies the Fruitland formation and is thought to provide a hydraulic barrier to overlying shallow aquifers from hydrocarbon development within the Fruitland formation.

The Mancos Shale interval is over 2,000 feet thick and below commonly used underground sources of drinking water. The Mancos Shale formation is in itself a barrier to fluid migration and is also overlain by the Lewis Shale and the Kirtland Shale formations that are also geological confining layers. The Lewis Shale (up to 2,000 feet thick) and the Kirtland Shale (up to 1,500 feet thick) are impermeable layers that isolate the Mancos Shale and Mesaverde formations from both identified sources of drinking water and

surface water. Total depth of proposed well bores in the Basin Mancos formation would be around 5,000 feet below the ground surface. Current fracturing in the Basin Mancos formation is not expected to occur above depths of 4,000 feet below the ground surface. Fracturing is not likely to extend into the Mesaverde formation from the lower portion of the Basin Mancos formation because of its depth.

3.9.2. Environmental Impacts

3.9.2.1. *Impacts of the Proposed Action*

Potential impacts to groundwater resources would vary depending on the type of oil and gas reserves developed from the nominated lease parcels. Examples of potential impacts could include groundwater depletion, the dewatering of adjacent water wells, contamination or cross-contamination of aquifers, and fluid spills that reach the groundwater (USEPA 2016b). Contamination or cross-contamination of groundwater resources would most likely occur from a mechanical or integrity failure of the well or by an undesired migration of gases or liquids within targeted formations or into adjacent geologic formations. Mechanical integrity failures of wells are typically associated with problems with the well casing and cement quality.

Coalbed methane development has had varying levels of impact on groundwater and associated resources within the San Juan Basin, particularly within the northern portion of the basin in Colorado near outcrops of the Fruitland formation. These issues include the migration and seepage of methane, the dewatering of adjacent water wells, vegetation die offs, and an overall depletion of groundwater from the Fruitland aquifer (BLM 1999; BLM and USFS 2006).

Water wells, springs, and seeps within and adjacent to the nominated lease parcels could be affected by oil and gas development if groundwater levels drop or if they are contaminated as a result of oil and gas development. The nominated lease parcels are generally located in areas with shallow groundwater.

Drilling and completion of potential oil and gas wells in the nominated lease parcels was estimated to use approximately 8,610,000 gallons (26.4 acre-feet) of water based on the number and type of well (Table 2.2) and values from Kelly et al. (2014). Vertical wells were assumed to use 150,000 gallons of water (0.5 acre-feet) for drilling and completion and horizontal wells were assumed to use 1,020,000 gallons of water (3.1 acre-feet) for drilling and completion. This water use is approximately 0.3% of the estimated water needed for drilling and completions in the 2018 RFD scenario, approximately 1.2% of the water use (surface and groundwater) by the oil and gas industry in water year 2010 in New Mexico, and approximately 0.004% of the water use (surface and groundwater) in McKinley, Rio Arriba, Sandoval, and San Juan Counties in water year 2010. Cumulative produced water production from the nominated lease parcels was estimated to approximate 977,445 million barrels of water (126.0 acre-feet).

3.9.3. Mitigation Measures

The BLM and NMOCD's casing, cementing, and inspection requirements would limit the potential for groundwater reservoirs and shallow aquifers to be impacted by fracking or the migration of hydrocarbons on the nominated lease parcels. Prior to approving an APD, a BLM geologist would identify all potential subsurface formations that would be penetrated by the wellbore including groundwater aquifers and any zones that would present potential safety or health risks that would need special protection measures during drilling, or that could require specific protective well construction measures. Casing programs and cement specifications would be submitted to the BLM and NMOCD for approval to ensure that well construction design would be adequate to protect the subsurface environment, including known or anticipated zones with potential risks or zones identified by the geologist. Surface casing would be set to an approved depth, and the well casing and cementing would stabilize the wellbore and provide protection to any overlying freshwater aquifers by isolating

hydrocarbon zones from overlying freshwater aquifers. Before hydraulic fracturing takes place, all surface casings and intermediate zones would be required to be cemented from the bottom of the cased hole to the surface. The cemented well would be pressure tested to ensure there are no leaks, and a cement bond log would be run to confirm that the cement has bonded to the steel casing strings and to the surrounding formations.

Water for any oil and gas development activities would be sourced in compliance with all Federal and state laws and regulations. Produced water would be disposed of at regulated and permitted commercial facilities (such as saltwater disposal wells) or would be used in the drilling and completion of wells. Saltwater disposal wells would be subject to the specifications mentioned above, including having the correct casing and cementing program, as well as pressure testing to protect groundwater formations. Groundwater wells generally do not occur in formations where produced water is disposed of.

3.9.4. Residual and Cumulative Impacts

The water demand to complete any future wells that could be drilled from the nominated lease parcels is not expected to exceed past development demands within the San Juan Basin and is within the estimated use noted in the 2018 RFD scenario (Crocker and Glover 2018).

The cumulative withdrawal of water from the Fruitland formation from coalbed methane wells could contribute to an overall depletion of local groundwater resources within the Fruitland aquifer system. Groundwater in this system would begin to recharge after hydrocarbon development, however this process could take a century or more to return to prior water levels (as noted in BLM and USFS 2006).

3.10. Issue 7: How would the proposed leasing impact nearby residences and communities relating to socioeconomics and environmental justice?

3.10.1. Affected Environment

The FFO is home to a wide variety of cultural, ethnic, and tribal communities. Multiple indigenous Native American populations inhabit the study area, and many Hispanic residents can trace their family's history of settlement of northern New Mexico back hundreds of years. These traditional and indigenous communities are intermingled with more recent Euroamerican groups and immigrants. Ranchers, miners, farmers, oil and gas workers, and service industry providers are all part of the socioeconomic mixture of people in the FFO.

The nominated lease parcels are located within rural areas of McKinley, Rio Arriba, Sandoval, and San Juan Counties of New Mexico which includes portions of the Navajo Nation and Jicarilla Apache Tribe Reservation.

All parcels are located on BLM-managed surface with Federal minerals except for parcel 071 which is located on private (fee) surface with Federal minerals. Parcel 071 is located near the community of Lindrith, NM. Parcels 089, 090, and 091 are located near the community of Ojo Encino near the Eastern boundary of the Navajo Nation in an area known as the "checkerboard"; these parcels are within the Ojo Encino Chapter House boundary of the Navajo Nation. The remaining parcels are also within the "checkerboard" area. Huerfano (Dzilh-Na-O-Dith-Hle) is the closest community to Parcels 111, 112, and 113 which are located within the Huerfano Chapter House boundary of the Navajo Nation. Pueblo Pintado is the closest community to parcels 107, 108, 109, and 110; parcels 107 and 108 are within the Counselor Chapter House boundary of the Navajo Nation and parcels 109 and 110 are within the Nageezi Chapter House boundary of the Navajo Nation.

3.10.1.1. *Socioeconomics and Areas of Analysis*

The nearest communities to the nominated lease parcels are Huerfano, Lindrith, Nageezi, Ojo Encino, Pueblo Pintado, and Torreon. Data on population, percent minority, percent Native American, income level, and poverty rates in affected Navajo Nation Chapters; the city of Farmington; McKinley, Rio Arriba, Sandoval, and San Juan Counties; and the State of New Mexico from the US Census Bureau (USCB) are provided in the below table (USCB 2018).

Table 3.9. Population, Percent Minority, Percent Native American, Income Level, and Poverty Data for Areas near the Nominated lease parcels Including Navajo Nation Chapters, Counties, and the State of New Mexico

LOCATION	POPULATION	MINORITY (%)	NATIVE AMERICAN (%)	PER CAPITA INCOME (\$)	MEDIAN HOUSEHOLD INCOME (\$)	POVERTY RATE (%)
Nageezi Chapter	900	99	99	8,912	18,375	53
Ojo Encino Chapter	597	100	97	7,335	20,000	55
Counselor Chapter	762	100	92	7,480	14,375	68
Huerfano Chapter	2,708	98	95	10,721	27,500	38
Farmington	44,067	52	23	26,001	52,598	17
McKinley County	72,564	92	74	16,305	31,565	41
Rio Arriba County	39,924	87	14	19,600	33,972	23
¹ Sandoval County	142,507	57	12	25,798	54,296	18
San Juan County	126,926	62	38	20,719	45,942	25
New Mexico	2,088,070	63	9	25,311	46,744	20
¹ Northern Sandoval County is primarily rural, with dispersed ranching and tribal communities scattered widely throughout the northeastern quarter of the county. Southeastern Sandoval County contains the rapidly growing communities of Rio Rancho and Bernalillo and associated suburban expansion. The presence of these communities in the southern part of the county accounts for the large difference in population and income relative to the other analysis areas in the table.						

Based on BLM FFO experience with the area of the Proposed Action and the residents within, it is assumed that data on percent minority, percent Native American, income, and poverty for the Navajo Nation Chapters is more representative of residences and communities near the Proposed Action than those of local counties or larger towns in the region.

As seen in the above table, nearby Navajo Nation Chapters range from 98-100% minority and 92-99% Native American. Poverty rates for these Chapters ranges from 38-68%. Per capita income for these Chapters is below the poverty threshold, and median household income is below the poverty threshold for these Chapters except the Huerfano Chapter which is just above the poverty threshold. In general, income is lower, poverty is higher, and the percentage of minority and Native American populations are higher near the Proposed Action than in surrounding cities, counties, and the State of New Mexico.

3.10.1.2. *Environmental Justice*

Environmental justice refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of

environmental laws, regulations, programs, and policies. It focuses on environmental hazards and human health to avoid disproportionately high and adverse human health or environmental effects on minority and low-income populations.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, requires that Federal agencies identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

The following environmental justice terminology developed by the Council on Environmental Quality (CEQ) is used in this analysis (CEQ 1997).

- Low-income population: A low-income population is determined based on annual statistical poverty thresholds developed by the USCB. In 2017, poverty level was based on a total income of \$12,752 for an individual and \$25,283 for a family of four (USCB 2017).
- Minority: Minorities are individuals who are members of the following population groups: American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic.
- Minority population area: A minority population area is so defined if either the aggregate population of all minority groups combined exceeds 50% of the total population in the area or if the percentage of the population in the area comprising all minority groups is meaningfully greater than the minority population percentage in the broader region.
- Comparison population: For the purpose of identifying a minority population or a low-income population concentration, the comparison populations used in this study are the surrounding counties and the State of New Mexico.

Given the above data and BLM experience with the residents and communities surrounding the Proposed Action, the BLM FFO concludes that there are low-income, minority, and Native American populations of concern (or “Environmental Justice Populations”), defined under EO 12898, that may be disproportionately impacted and potentially adversely impacted by activities resulting from development of the nominated lease parcels.

3.10.2. Environmental Impacts

3.10.2.1. *Impacts of the Proposed Action - Socioeconomics*

The nominated lease parcels analyzed in this EA cover a relatively small area, and development of the nominated parcels is not anticipated to cause large increases in employment or area populations, nor cause significant impacts to the demand for local government services, infrastructure, or housing. Additional employment opportunities and local revenue increases, while anticipated to be small, could occur in areas near the nominated lease parcels.

3.10.2.2. *Impacts of the Proposed Action – Environmental Justice*

Residents and communities surrounding the nominated lease parcels would generally experience a disproportional level of direct and indirect impacts due to their proximity to any future oil and gas development. Some of these effects would be temporary, such as the addition of project lighting or flaring to the landscape. Other effects, such as the addition of roads and oil and gas facilities to the region, would be long term for the lifetime of the projects. The construction of new access roads near the nominated lease parcels could allow increased public access and traffic, and could expose private property to vandalism. Based on ongoing consultation with residents and communities that may be disproportionately and adversely affected by actions resulting from this lease sale, BLM may develop lease stipulations, COAs, design features, and BMPs to address environmental justice concerns.

associated with new oil and gas development. Surface owner agreements would apply to private surface owners on split estate leases which could also address environmental justice concerns.

Impacts from GHG emissions associated with potential oil and gas development of the nominated lease parcels are not anticipated to be disproportional or adverse to environmental justice populations surrounding the nominated lease parcels because of the widespread nature of impacts and general uncertainty of the measurement of GHG impacts.

Disproportional impacts to environmental justice populations surrounding the nominated lease parcels may occur relating to air quality, visual resources, noise, and dark skies; these impacts are not anticipated to be adverse.

Emissions impacts on air quality from any potential oil and gas development on the nominated lease parcels could occur from vehicle use, compressors, and venting and flaring among other sources. These emissions impacts would be more concentrated near the nominated lease parcels, but are not anticipated to exceed National or New Mexico air quality standards nor be threatening to human health of local residents and communities.

Potential oil and gas development on the nominated lease parcels would introduce human made industrial elements (e.g. pump jacks, tanks, pipeline infrastructure) to the landscape as well as add new features to the landscape (e.g. roads, pipeline corridors, well pads). Viewshed impacts would be more concentrated near the nominated lease parcels and could change the natural setting and visual character of the landscape.

Potential oil and gas development on the nominated lease parcels would introduce new sounds and noise to the landscape which could increase the ambient noise conditions near the nominated lease parcels for short term durations (e.g. drilling and stimulation) or long term durations (e.g. compression and traffic). Noise impacts may be undesirable to nearby environmental justice populations, but are not foreseen to be adverse or threatening to the human health of local residents and communities.

Potential impacts to night skies from any oil and gas development on the nominated lease parcels are anticipated to be temporary and could increase the amount of illumination to the night sky during construction, drilling, stimulation, and flaring periods. These impacts may be undesirable but are not foreseen to be adverse or threatening to local environmental justice populations.

Potential impacts to groundwater quantity and quality may also be disproportional, and have the potential to be adverse, particularly to residents and communities surrounding lease parcels 089, 090, 091, 107, 108, 109, and 110 where springs, water wells, residences, and communities are colocated. Potential impacts to local water wells could force residents to find other means of supplying water for domestic or other uses. Potential impacts to natural springs, including the Ojo Encino and Ojo Sandoval springs, could have adverse effects on traditional and ceremonial use of the springs and the historical character and importance of the springs to the surrounding region.

Previous scoping and public comments by Navajo Nation Chapters have expressed general concerns about the impacts of continued oil and gas development on the condition of roads in the area, traffic safety, water quality, visual resources, and air quality, among others. Water is a critically valued resource by local residents and communities of the Navajo Nation and in the region of the Proposed Action. Pueblos and tribes share concerns for the protection of, and access to, areas of traditional and religious importance, and the welfare of plants, animals, air, landforms, and water on tribal and public lands.

The residents and communities surrounding the nominated lease parcels would be dependent on the BLM for rules, mitigations, best management practices, COAs, and enforcement actions for oil and gas development. These dispersed communities do not have additional policies or ordinances in place that

would regulate certain impacts. As an example, the City of Farmington, which could offer stronger protections than those of the BLM. As an example, the City of Farmington has defined ordinances for oil and gas development within the city limits that include rules for the maximum allowable height for pumping units, require sound mitigation paneling, and enforce noise restrictions that bar increases in the ambient noise level at a distance of 300 feet from the nearest occupied building (City of Farmington 2018). Additional protections like these are being analyzed in the Farmington Mancos-Gallup RMPA and EIS that is in development and anticipated to be completed in 2019.

Guidance from the CEQ (1997, page 10) states that:

- “Under NEPA, the identification of a disproportionately high and adverse human health or environmental effect on a low-income population, minority population, or Indian tribe does not preclude a proposed agency action from going forward, nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. Rather, the identification of such an effect should heighten agency attention to alternatives (including alternative sites), mitigation strategies, monitoring needs, and preferences expressed by the affected community or population.”

Based on comments gained during scoping, the general preferences of the local communities near the nominated lease parcels would be to have no new oil and gas leasing until the Farmington Mancos-Gallup Draft RMPA and EIS is finished, tribal consultation has been conducted, and Section 106 requirements of the NHPA have been completed for the broader Chacoan landscape. The BLM must provide these affected environmental justice populations reasonable opportunities to identify adverse environmental impacts that may arise from development of the nominated lease parcels in this lease sale, and should collaborate with the affected populations to determine methods and measures to alleviate any perceived adverse environmental impacts. The BLM cannot identify and mitigate any identified disproportionate and adverse effects unilaterally, but rather must do so in collaboration with the affected communities.

If future development occurs on the nominated lease parcels, identified and affected environmental justice populations would be given the opportunity to identify any environmental impacts that might arise from development that could have disproportionately high and adverse effects. Identified environmental justice populations that may be disproportionately and adversely impacted by development of the nominated lease parcels would be engaged and offered opportunities for meaningful involvement in alternatives development, mitigation strategies, and monitoring needs by the BLM FFO.

3.10.3. Mitigation Measures

Standard design features and project specific COAs would help to minimize potential effects that could be disproportional or adverse. Lease stipulation F-44-NSO would apply, and designate that no surface occupancy is allowed within 660 feet of any occupied residences of a community to reduce impacts to the community from drilling and production activities. Noise would be kept at or below 48.6 dBA within 100 feet of all occupied residences surrounding the nominated lease parcels as described in NTL 04-2 FFO (BLM 2004).

Policies established in 2006 by the BLM and US Forest Service, in coordination with Federally recognized tribes, ensure access by traditional native practitioners to area plants. The policy ensures that management of these plants promotes ecosystem health for public lands. The BLM is encouraged to support and incorporate into their planning traditional native and native practitioner plant-gathering for traditional use (Boshell 2010). If trees are located on any future project location, BLM FFO practice would be that trees 3 inches or greater in diameter at ground level would be cut to ground level and

delimbed. Tree trunks and cut limbs would be stacked along future projects' access roads for wood gatherers, or wood would be delivered to the appropriate Chapter House of the Navajo Nation.

3.10.4. Residual and Cumulative Impacts

The addition of new roads, infrastructure, and facilities from oil and gas development on the nominated lease parcels would contribute to an increase in the industrial feel of the visual landscape, and existing noise levels are anticipated to increase from any new oil and gas development. These impacts would remain for the lifetime of any projects developed on the nominated lease parcels. Oil and gas exploration, drilling, and production could create additional disruptions to these environmental justice populations including increased traffic and road operations and maintenance.

CHAPTER 4. TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

The following consultation and coordination efforts with tribes, individuals, organizations, and agencies were conducted for the proposed leasing actions.

4.1. Tribal Consultation

Tribal consultation for the proposed leasing action was initiated on a government to government basis by the BLM FFO to various Pueblos and tribes of New Mexico and Southern Colorado. A letter and map describing the proposed leasing and inviting consultation with the BLM FFO was sent via certified mail to each of the various Pueblos and tribes listed in Table 4.1 on July 23, 2018 with a request for response within 30 days of receipt.

Table 4.1. Pueblos and Tribes Sent Consultation Requests from the BLM FFO

ENTITY	Person
Pueblo of Acoma	Governor Kurt Riley
All Pueblo Council of Governors	Governors
Becenti Chapter House	President Charles Long
Pueblo of Cochiti	Governor Dwayne Herrera
Counselor Chapter House	President Harry Domingo, Sr.
Eight Northern Indian Pueblo's Council	Governors
Five Sandoval Indian Pueblos	Governors
Huerfano Chapter House	President Ben Woody, Jr.
Pueblo of Isleta	Governor J. Robert Benavides
Pueblo of Jemez	Governor Paul S. Chinana
Jicarilla Apache Tribal Council	President Levi Pesata
Kewa Pueblo	Governor Thomas Moquino, Jr.
Pueblo of Laguna	Governor Virgil A. Siow
Lake Valley Chapter House	President Tony Padilla, Jr.
Nageezi Chapter House	President Ervin Chavez

Table 4.1. Pueblos and Tribes Sent Consultation Requests from the BLM FFO

ENTITY	Person
Pueblo of Nambe	Governor Phillip A. Perez
Navajo Nation	President Russell Begaye
Ohkay Owingeh	Governor Peter Garcia, Jr.
Ojo Encino Chapter House	President George Werito
Pueblo of Picuris	Governor Craig Quanchello
Pueblo of Pojoaque	Governor Joseph M. Talachy
Pueblo Pintado Chapter House	President Rena Murphy
Pueblo of San Felipe	Governor Anthony Ortiz, Director Pinu'u Stout, Department of Natural Resources
Pueblo of San Ildefonso	Governor Perry Martinez
Pueblo of Sandia	Governor Richard Bernal
Pueblo of Santa Ana Tribal Historic Preservation Office	Tim Menchego
Pueblo of Santa Ana	Governor Glenn Tenorio
Pueblo of Santa Clara	Governor J. Michael Chavarria
Southern Ute Indian Tribe	Chairwoman Christine Baker-Sage
Pueblo of Taos	Governor Gilbert Suazo, Sr.
Ten Southern Pueblo Governor's Council	Governors
Pueblo of Tesuque	Governor Frederick Vigil
The Hopi Tribe	Chairman Timothy L. Nuvangyaoma
Torreon Chapter House	President David Rico
Ute Mountain Ute Tribe	Chairman Harold Cuthair
White Rock Chapter House	President Herbert Benally
Whitehorse Lake Chapter House	President Art L. Chavez
Pueblo of Zia	Governor Anthony Delgarito
Pueblo of Zuni	Governor Val Panteah, Sr.

Consultation requests for the FFO December 6, 2018 Competitive Oil and Gas Lease Sale were received by the BLM from the Hopi Tribe, National Trust for Historic Preservation, Tri-Chapters of the Eastern Navajo Nation (Ojo Encino, Counselor, Torreon/Star Lake), Pueblo of San Felipe, Pueblo of Acoma, Pueblo of Isleta, Pueblo of Sandia, and All Pueblo Council of Governors either through comments received during public scoping or in response to the consultation letter sent by the BLM.

Consultation with the above parties and the BLM FFO is ongoing for the FFO December 6, 2018 Competitive Oil and Gas Lease Sale and has been limited in scope given the ongoing work needed for a thorough cultural resources analysis. Consultation concerns have been raised regarding the leasing process, inadequate notice for consultation, road development in the region, cultural resources, and the Section 106 of the NHPA process. Consultation details for cultural resources and the Section 106 of the NHPA process are discussed in the section below.

4.2. Cultural Resources Consultation and Analysis

Section 106 of the NHPA and its implementing regulations (36 CFR Part 800) require Federal agencies to consider what effect their licensing, permitting, funding, or otherwise authorizing an undertaking, such as an APD or right-of-way (ROW), may have on properties on or eligible for listing on the National Register of Historic Places (NRHP). 36 CFR Part 800.16 gives specific definitions for key cultural resource management concepts such as undertakings, effects, and areas of potential effect.

The New Mexico BLM has a two party agreement with the New Mexico SHPO (Protocol) that implements an authorized alternative to 36 CFR Part 800 for most undertakings (BLM New Mexico and SHPO 2014). This agreement offers a streamlined process for reporting and review that expedites consultation with the SHPO. However, certain circumstances, including intense public controversy over an undertaking, may result in SHPO or BLM requiring use of the standard Section 106 consultation procedures outlined in 36 CFR Part 800 rather than the Protocol. Due to the controversy surrounding past lease sales and initial feedback from tribes, non-governmental organizations, and the public for this proposed undertaking, BLM anticipates at least some of the nominated lease parcels would follow more intensive schedules of consultation with the SHPO. Because the offering of any given parcel is not contingent on the offering of another, nominated lease parcels may be grouped in any combination as separate undertakings.

The Protocol details how the New Mexico BLM and SHPO regulate their relationship and consult. Specifically, this document outlines among other things, how and when consultation is conducted between the BLM, SHPO, tribes, and the public. The protocol also outlines when case-by-case SHPO consultation is or is not required for specific undertakings, the procedures for evaluating the effects of common types of undertakings, and details how to resolve adverse effects to historic properties. These common types of undertakings regularly include actions undertaken by the BLM FFO.

In the absence of separate agreements, 36 CFR Part 800 guides Section 106 consultation with Tribal Historic Preservation Officers (THPOs), Native American tribes, local governments, and public entities. 36 CFR Part 800.3 outlines the process by which the agency identifies consulting parties. Non-specialists may find useful information on the public's role in the Section 106 process in the Advisory Council on Historic Preservation's (ACHP's) publication, A Citizen's Guide to Section 106 Review (ACHP 2016).

Oil and gas development involves at least two undertakings: the leasing of the minerals and the site specific development of the lease(s) through submittal of an APD(s). The BLM FFO plans to assess the undertaking's potential to affect historic properties at the leasing stage primarily by means of an existing literature and data review. Site-specific identification efforts, including Class III cultural resources inventories, would occur later, at the APD stage. The BLM FFO would consult data from the New Mexico Cultural Resources Information System (NMCRIS) database and BLM FFO's own legacy paper maps to identify known historic properties and other cultural resources within the project's area of potential effect (APE). Specifically, the BLM FFO would identify relevant sites in each of the direct and indirect effect APEs. Direct effects can impact any category of site. In contrast, generally, sites eligible for NRHP listing for reasons other than or in addition to their archaeological data potential (Criterion D),

especially those for which setting is an important aspect of integrity, are susceptible to principal types of indirect effects such as impacts to their viewshed or soundscape. Such sites may be susceptible to non-physical impacts that undermine the sites' setting or other aspects of integrity, as given at 36 CFR Part 800.5(a)(1).

In addition, the BLM FFO would search alternative data sets and ethnographic reports to identify additional cultural resources and potential historic properties not represented in NMCRIS. These sources include databases of Chacoan outliers and known Chacoan road segments, a database of early historic defensive sites (pueblitos), and various ethnographic reports including the 2013 ethnographic overview of the San Juan Basin prepared for Bureau of Reclamation's Navajo-Gallup Water Supply Project. The BLM FFO would examine the potential for unrecorded Chacoan road segments in the APE through a combination of projections from known Chacoan road segments, alignments visible in PII-PIII era sites represented in NMCRIS, and digital elevation models derived from the BLM FFO's 2016 bare-earth lidar data collection near CCNHP.

Due to the high level of concern previously expressed by tribes and the public regarding potential indirect effects of oil and gas development on Chacoan sites and other especially sensitive cultural resources, the analysis of potential effects would address key resources that may fall outside the designated APE. Utilizing concepts and procedures outlined in BLM Manual 8431 (Visual Resource Contrast Rating) and Appendix C of the Protocol between the Wyoming SHPO and BLM (BLM Wyoming and SHPO 2014), the FFO would determine the potential for foreseeable development on the parcels to create weak, moderate, or strong visual contrast from the perspective of an observer at sites including Chaco Culture Archaeological Protection Sites (PL 96-550) and the Chaco Great North Road. All UNESCO World Heritage Sites pertaining to the Chaco Culture listing and outside the main unit of CCNHP are a subset of the Chaco Culture Archaeological Protection Sites.

Appendix C of the Wyoming State Protocol between BLM and SHPO offers a tested methodology for assessing the potential for visual impacts to distant sites through the mechanisms of BLM's existing VRM program. It associates visual contrast ratings with effects to historic properties sensitive to viewshed impacts in the following manner:

- No visual contrast = no historic properties affected;
- Weak visual contrast = no adverse effect to sensitive historic properties; and
- Moderate or strong visual contrast = adverse effect to sensitive historic properties.

While developments more than one mile from the direct APE are unlikely to require treatment besides the application of standard environmental colors to effectively eliminate visual contrast and yield no effect to historic properties, this review would help ensure the most prominent and sensitive resources are given full consideration during the assessment of effects. It would also test the appropriateness of the preliminary indirect APE. Both portions of the APE are subject to change pending the results of consultation with the SHPO, the Navajo Nation THPO, Native American tribes, and other consulting parties.

In almost all cases, the Section 106 process concludes with a finding of no effect to historic properties, a finding of no adverse effect, or an agreement to mitigate adverse effects. In the unlikely circumstance that the Section 106 process concludes with the identification of unmitigated adverse effects to historic properties, further NEPA analysis and reporting would be necessary prior to signature of the decision record to disclose these significant impacts to cultural resources.

Various authorities, including AIRFA, EO 13007, and the National Trails System Act, mandate Federal protections for cultural resources that may not meet operating definitions of historic properties, as defined by NHPA, or archaeological resources, as defined by ARPA. However, due to a high degree of

conceptual and real overlap between such resources and historic properties, the BLM FFO would most effectively and efficiently accomplish the impacts analysis for these resources in tandem with the Section 106 review. At the leasing stage, the BLM FFO would utilize existing literature, existing data sets, and feedback from consultation and/or coordination with Native American tribes to identify and analyze the potential for impacts to cultural resources other than historic properties. Further analysis and consultation would occur at the site specific APD stage, including consultation or coordination with Native American tribes, pursuant to BLM Manuals 1780 (Tribal Relations) and 8110 (The Foundations for Managing Cultural Resources), and potentially including consultation with the NPS and the Old Spanish Trail Association, pursuant to BLM Manual 6280 (Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation). Similar to Section 106 of the NHPA, these other guiding authorities encourage the avoidance or resolution of impacts with sufficient force that significant impacts are highly unlikely following the conclusion of review and consultation processes. In the unlikely circumstance that these review processes conclude with the identification of unmitigated adverse effects to sites with traditional cultural or religious significance or unmitigated instances of substantial interference with the nature and purpose of National Historic Trails, further NEPA analysis and reporting would be necessary prior to signature of the decision record to disclose these significant impacts to cultural resources other than historic properties.

Section 106 consultation for the nominated parcels was initiated with the New Mexico SHPO and Navajo Nation THPO by letters sent on September 13, 2018. No comments have been received by the BLM FFO on the proposed APE or general approach to consultation. No comment was received on BLM FFO's proposal to potentially pursue consultation with SHPO on Parcel 071, located more than 40 miles from CCNHP or other Chacoan sites, under the streamlined review provisions of the BLM-SHPO Protocol.

In response to the letter, Navajo Nation Historic & Heritage Preservation Department (NNH&HPD) accepted consulting party status for Section 106 review of all parcels, in addition to the Navajo THPO's obligatory role in consultation about the portion of the APE on Navajo Nation surface. General invitations for further consultation were sent to tribes on July 23, 2018 and comments made during the scoping period yielded consulting party status for the Hopi Tribe, the Pueblo of Isleta, the Pueblo of San Felipe, and the Pueblo of Sandia, as well as assumed or explicit requests for consulting party status from the Counselor, Ojo Encino, and Torreon Chapters of the Navajo Nation, the All Pueblo Council of Governors, and the National Trust for Historic Places. Various consulting parties for the FFO March 2018 Competitive Oil and Gas Lease Sale, including the Pueblo of Acoma, Archaeology Southwest, the National Park Service (CCNHP and Aztec Ruins National Monument), and BIA (Eastern Navajo Agency), will most likely be invited or re-invited to participate as consulting parties for the FFO December 6, 2018, Competitive Oil and Gas Lease Sale. An existing records inventory, aimed at identifying known archaeological resources and sites of traditional religious and cultural importance in the APE, will serve as the basis for future Section 106 consultation. Such an inventory may be prepared under a modification to an existing contract for the FFO March 2018 Competitive Oil and Gas Lease Sale records inventory or by BLM archaeologists. No time frame is yet available for its completion.

Consultation for Parcel 071 began in March 2014, with letters initiating consultation with the New Mexico SHPO and inviting the following parties to further consultation on a group of 35 nominated lease parcels: National Park Service (CCNHP and National Trails Intermountain Region), Navajo Nation and seven potentially affected chapters (Nageezi, Counselor, Hogback, Nenahnezad/San Juan, Upper Fruitland, Ojo Encino, Torreon, and Pueblo Pintado), Jicarilla Apache Nation, Ute Mountain Ute Tribe, Southern Ute Tribe, the pueblos of Zia, Zuni, Jemez, Acoma, and the Hopi Tribe, and the National Trust for Historic Preservation, the Chaco Alliance, and the Old Spanish Trail Association (OSTA). The New

Mexico SHPO, the Hopi Tribe, and OSTA responded. The OSTA (March 24, 2014) identified concerns with the visual and auditory impact of development on the setting of the OST and recommended that BLM conduct a viewshed analysis and establish inventory observation points. The Hopi (March 25, 2014) requested and were subsequently provided a cultural resources overview for review and comment. No further comments specific to this lease sale were received from the Hopi Tribe. The BLM concluded with a tentative determination of no adverse effect to historic properties, sites of traditional religious and cultural importance, and sacred sites for the suite of 35 parcels analyzed for the October 2014 lease sale. BLM ultimately deferred the decision to lease for all parcels outside the Santa Fe National Forest, including Parcel 071 of the present sale (DOI-BLM-NM-F010-2014-0154-EA; <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/new-mexico>).

CHAPTER 5. LIST OF PREPARERS

Table 5.1 contains a list of individuals or organizations from the public, external agencies, and the BLM that contributed to or reviewed this EA.

Table 5.1. List of EA Preparers

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Table 5.1. List of EA Preparers

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CHAPTER 6. REFERENCES

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CHAPTER 7. APPENDICES

7.1. Appendix A – Nominated Parcels and EA Analysis Status for FFO December 6, 2018, Competitive Oil and Gas Lease Sale

Table 7.1. Nominated Parcels and EA Analysis Status for FFO December 6, 2018, Competitive Oil and Gas Lease Sale

LEASE PARCEL #	SURFACE OWNERSHIP	LEGAL DESCRIPTION	ACRES	LEASE STIPULATIONS	STATUS
NM- 201812- 071	Private	T.24N, R. 2W, NM PM, NM Sec. 013 NW; Rio Arriba County Farmington FO	160.000	WO-ESA-7 WO-NHPA NM-11-LN F-4-TLS F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 089	BLM	T.20N, R. 5W, NM PM, NM Sec. 003 SW; Sec. 010 N2; McKinley County Farmington FO	480.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-9-CSU F-40-CSU F-41-LN F-44-NSO F-46-CSU	Analyzed in Alternative A – Proposed Action
NM- 201812- 090	BLM	T.20N, R. 5W, NM PM, NM Sec. 017 ALL; Sec. 018 LOTS 3, 4; Sec. 018 S2NE, E2SW, SE; Sec. 020 NE; McKinley County Farmington FO	1,200.240	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-40-CSU F-41-LN F-44-NSO F-46-CSU	Analyzed in Alternative A – Proposed Action
NM- 201812- 091	BLM	T.20N, R. 5W, NM PM, NM Sec. 022 S2SW, W2SE, S2SESE; McKinley County Farmington FO	180.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action

Table 7.1. Nominated Parcels and EA Analysis Status for FFO December 6, 2018, Competitive Oil and Gas Lease Sale

LEASE PARCEL #	SURFACE OWNERSHIP	LEGAL DESCRIPTION	ACRES	LEASE STIPULATIONS	STATUS
NM- 201812- 105	BLM	T.32N, R. 5W, NM PM, NM Sec. 007 LOTS 1, 2, 3, 4; Sec. 008 LOTS 1, 2, 3, 4; Sec. 008 S2N2, S2; Sec. 009 LOTS 4; Sec. 009 SWNW, W2SW; Rio Arriba County Farmington FO	844.340	N/A	Eliminated (not in conformance with 2003 Farmington RMP)
NM- 201812- 106	BLM	T.32N, R. 5W, NM PM, NM Sec. 017 ALL; Sec. 020 ALL; Sec. 021 W2W2; Rio Arriba County Farmington FO	1,440.000	N/A	Eliminated (not in conformance with 2003 Farmington RMP)
NM- 201812- 107	BLM	T.21N, R. 7W, 23 NM PM, NM Sec. 021 E2SW; Sandoval County Farmington FO	80.000	WO-ESA-7 WO-NHPA NM-11-LN F-8-VRM F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 108	BLM	T.21N, R. 7W, 23 NM PM, NM Sec. 028 NE; Sandoval County Farmington FO	160.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-7-VRM F-8-VRM F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 109	BLM	T.21N, R. 7W, 23 NM PM, NM Sec. 029 E2, SW; Sandoval County Farmington FO	480.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-7-VRM F-8-VRM F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 110	BLM	T.21N, R. 7W, 23 NM PM, NM Sec. 033 W2; Sandoval County Farmington FO	320.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN	Analyzed in Alternative A – Proposed Action

Table 7.1. Nominated Parcels and EA Analysis Status for FFO December 6, 2018, Competitive Oil and Gas Lease Sale

LEASE PARCEL #	SURFACE OWNERSHIP	LEGAL DESCRIPTION	ACRES	LEASE STIPULATIONS	STATUS
				F-7-VRM F-8-VRM F-40-CSU F-41-LN F-44-NSO	
NM- 201812- 111	BLM	T.25N, R. 11W, 23 NM PM, NM Sec. 029 S2; San Juan County Farmington FO	320.000	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-34-VRM F-35-LN F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 112	BLM	T.25N, R. 11W, 23 NM PM, NM Sec. 030 LOTS 2; Sec. 030 SENW; San Juan County Farmington FO	80.280	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-34-VRM F-35-LN F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action
NM- 201812- 113	BLM	T.25N, R. 11W, 23 NM PM, NM Sec. 034 LOTS 20, 21, 23; San Juan County Farmington FO	85.950	WO-ESA-7 WO-NHPA NM-1-LN NM-11-LN F-8-VRM F-34-VRM F-35-LN F-40-CSU F-41-LN F-44-NSO	Analyzed in Alternative A – Proposed Action

7.2. Appendix B – Maps

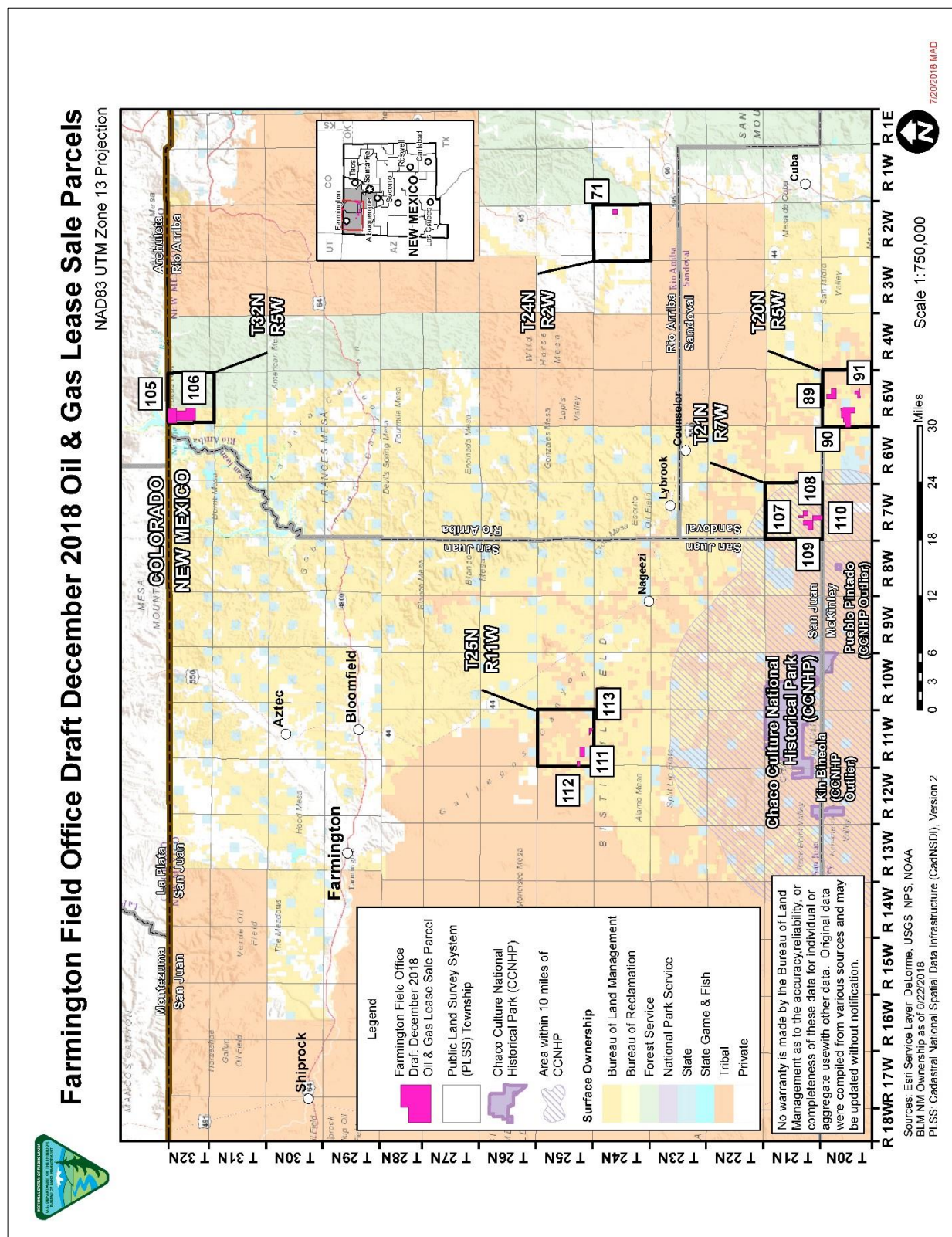


Figure 7.1. Farmington Field Office December 6, 2018, Competitive Oil and Gas Lease Sale Parcels

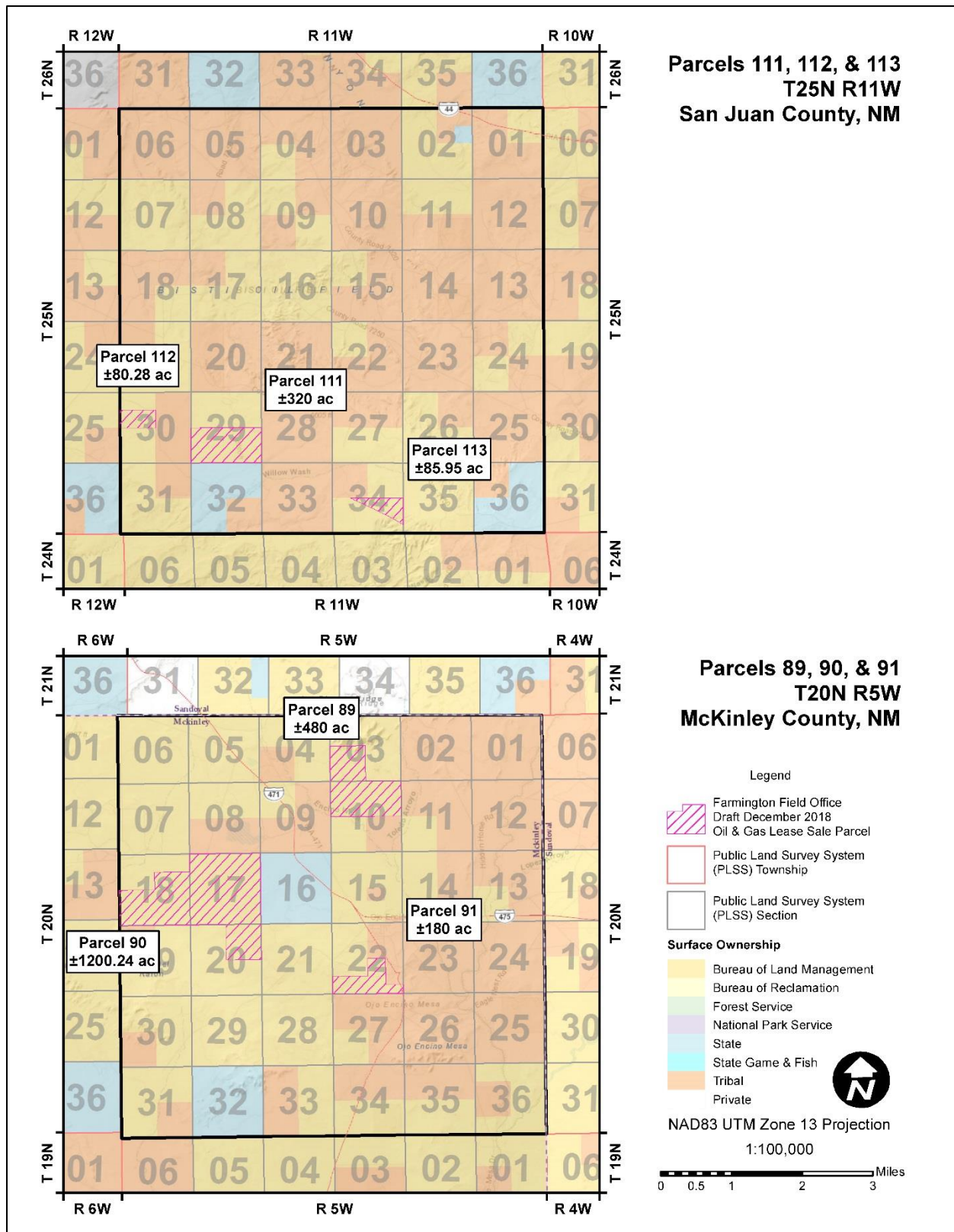


Figure 7.2. Nominated lease parcels 089, 090, 091, 111, 112, and 113

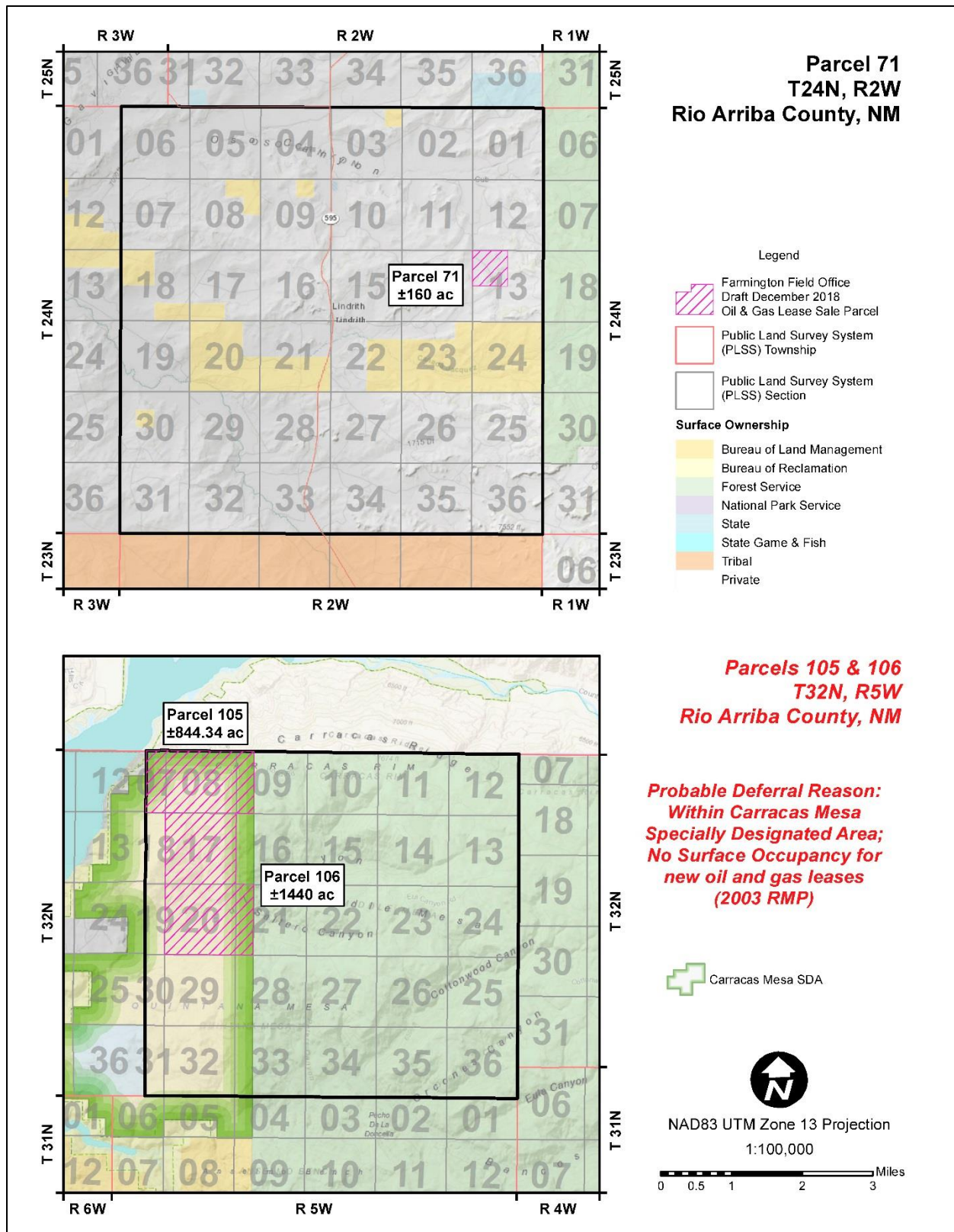


Figure 7.3. Nominated lease parcels 071, 105, and 106

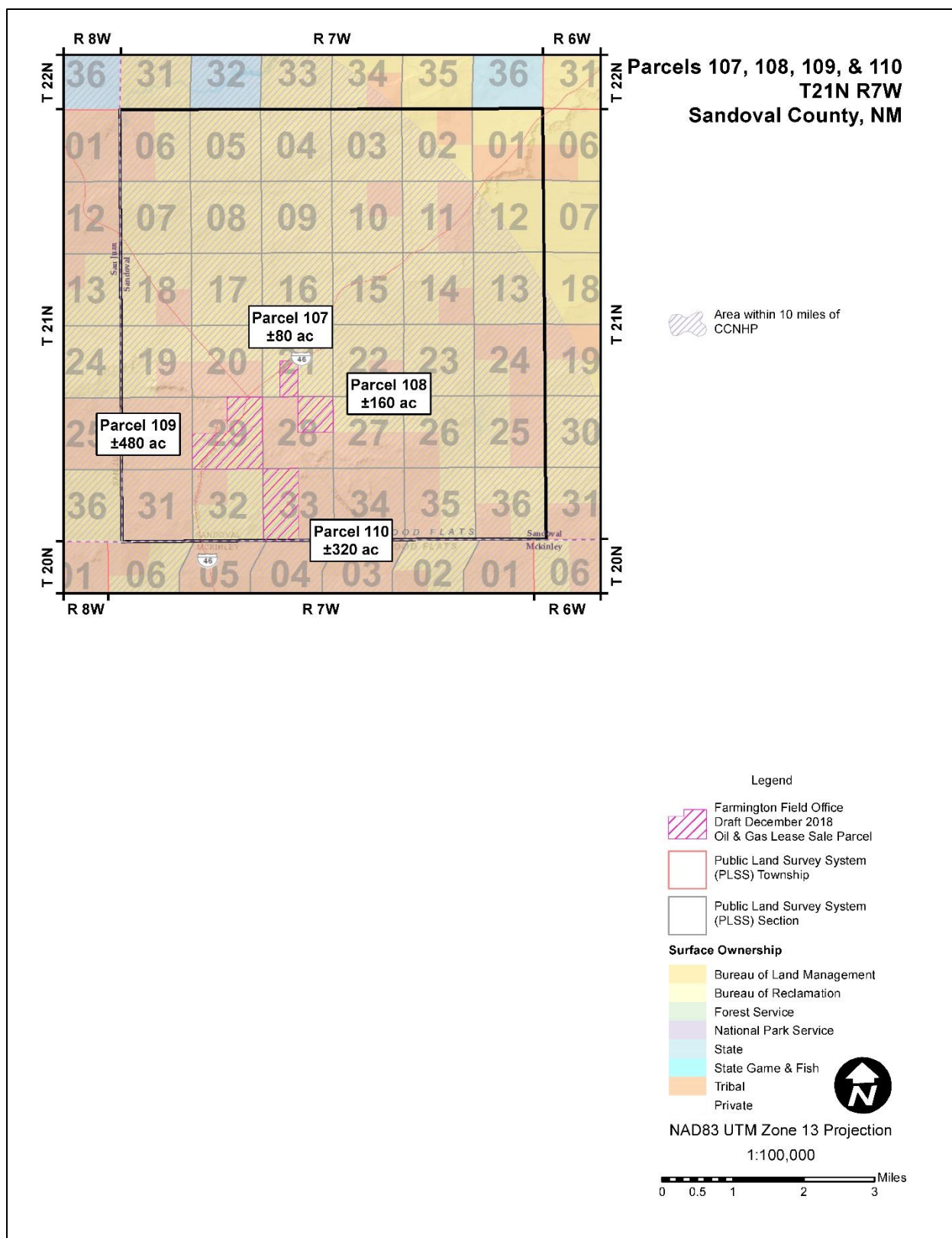


Figure 7.4. Nominated lease parcels 107, 108, 109, and 110

7.3. Appendix C – FFO Lease Stipulation Summary

Table 7.2. List of Lease Stipulations

STIPULATION	DESCRIPTION/PURPOSE
F-4-TLS	<p>TIMING LIMITATION STIPULATION IMPORTANT SEASONAL WILDLIFE HABITAT</p> <p>No surface use is allowed during the following time period.</p> <p>December 1 through March 31</p> <p>In addition, no surface use is allowed during the following time period to accommodate the migration of big game within the Lajara and Regina migration route.</p> <p>November 15 through March 31</p> <p>This stipulation does not apply to operation and maintenance of production facilities.</p> <p>On the lands described below:</p> <p>For the purpose of: Protection of important wildlife habitat (big game winter range).</p> <p>If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impacts, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington Resource Management Plan, or if not consistent, through a land use plan amendment and associated National Environmental Policy Act analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification shall be subject to a 30-day public review period.</p> <p>Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes</p>
F-7-VRM	<p>VISUAL RESOURCE MANAGEMENT CLASS III OBJECTIVES SPECIAL STIPULATION</p> <p>Surface occupancy or use is subject to the following operational constraints:</p> <p>Surface activities in this parcel are subject to Visual Resource Management (VRM) Class III restrictions as set forth in BLM Manual 8400 – Visual Resource Management.</p> <p>The leaseholder is required in any surface activity to <u>partially retain</u> the existing character of the landscape. Activities <u>may attract attention</u>, but <u>should not dominate the view</u>. This may require additional mitigation methods such as special painting stipulations, site placement, and/or any other measures necessary to meet VRM Class III objectives.</p> <p>The need for additional mitigation to meet VRM Class III will be determined on a case-by-case basis for each proposed well.</p> <p>For the purpose of: Protecting Visual Resources</p>
F-8-VRM	<p>VISUAL RESOURCE MANAGEMENT CLASS IV OBJECTIVES SPECIAL STIPULATION</p> <p>Surface occupancy or use is subject to the following operational constraints:</p> <p>Surface activities in this parcel are subject to Visual Resource Management (VRM) Class IV restrictions as set forth in BLM Manual 8400 – Visual Resource Management.</p> <p>Provide for management activities which require major modification of the existing character of the landscape. Activities <u>may attract attention</u>, <u>may dominate the view</u>, but are still mitigated. This may require additional mitigation methods such as special painting stipulations, site placement, and/or any other measures necessary for VRM Class IV objectives.</p>

Table 7.2. List of Lease Stipulations

STIPULATION	DESCRIPTION/PURPOSE
	<p>The need for additional mitigation to meet VRM Class IV will be determined on a case-by-case basis for each proposed well.</p> <p>For the purpose of: Protecting Visual Resources</p>
F-9-CSU (Paleo)	<p>CONTROLLED SURFACE USE STIPULATION PALEONTOLOGY</p> <p>Surface occupancy or use is subject to the following special operating constraints: Restrict vehicles to existing roads and trails and require a paleontological clearance on surface disturbing activities.</p>
F-34-VRM	<p>VISUAL RESOURCE MANAGEMENT – CLASS I AREA BISTI/DE-NA-ZIN</p> <p>All development activities proposed under the authority of this lease are subject compliance with Section 102(a)(8) of the Federal Land Policy and Management Act. Specifically, the lease is adjacent to the Bisti/De-Na-Zin wilderness area. Management prescriptions delineated in the 2003 Farmington RMP implement VRM Class I objectives for the wilderness area and may require site-specific mitigation measures such as alternate project locations, low profile tanks, or other measures to reduce visual impacts to the wilderness area. The BLM may require modifications to or disapprove proposed activities that cannot be mitigated and which would adversely affect the VRM objectives. This could result in extended time frames for processing authorizations for development activities, as well as changes in the ways in which developments are implemented.</p>
F-35-LN	<p>LEASE NOTICE – NOISE</p> <p>This lease is adjacent to a noise sensitive area (Bisti/De-Na-Zin Wilderness Area). Noise sources that operate on a continual basis (more than 8 hours/day), long term (more than 1 week in duration) cannot exceed a noise level of 48.6 dB(A)Leq at the boundary of the wilderness area. If 48.6 dB(A)Leq does not provide an adequate level of protection from the auditory impact created by lease operations, a stricter stand shall be applied. BLM staff would work with the leaseholder on a case-by-case basis to achieve an acceptable level of noise mitigation. This requirement will not normally apply to transient operations such as construction, drilling, completion, workover activities, and other temporary sound sources. These short-term activities will be handled on a case-by-case basis during the permitting process. Compliance with the Field Office noise policy could result in extended time frames for processing authorizations for development activities, as well as changes in the ways in which developments are implemented.</p>
F-40-CSU	<p>CONTROLLED SURFACE USE STIPULATION SPECIAL CULTURAL VALUES AND/OR TRADITIONAL CULTURAL PROPERTIES</p> <p>Controlled surface use is allowed on the lands described below:</p> <p>For the purpose of: Protection of known cultural resource values and/or traditional cultural properties in areas not already within ACECs.</p> <p>If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impacts, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the Farmington Resource Management Plan, or if not consistent, through a land use plan amendment and associated National Environmental Policy Act analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period.</p>

Table 7.2. List of Lease Stipulations

STIPULATION	DESCRIPTION/PURPOSE
	Any changes to this stipulation will be made in accordance with the land use plan and or the regulatory provisions for such changes.
F-41-LN	<p>LEASE NOTICE - BIOLOGICAL SURVEY</p> <p>A biological survey may be required prior to any surface disturbing activity on BLM managed lands. Proposed activities may be subject to seasonal closures within sensitive species habitat. Federal land management agencies are mandated to manage special status species so they should not need to be listed under Endangered Species Act (ESA) in the future.</p>
F-44-NSO	<p>NO SURFACE OCCUPANCY-COMMUNITY & RESIDENCE</p> <p>No surface occupancy is allowed within 660 feet of any occupied residences of a community to reduce impacts to the community of drilling and production activities. This stipulation may be waived, excepted, or modified by BLM, if such action is consistent with the Resource Management Plan.</p>
F-46-CSU	<p>CONTROLLED SURFACE USE STIPULATION – TOPOGRAPHY</p> <p>Surface-disturbing such as well pad activities and related facilities are prohibited on slopes 15% and greater and/or side hill cuts of more than 3 feet vertical. Maximum grade on collector and arterial roads is 8% (except pitch grades not exceeding 300 feet in length and 10% in grade).</p> <p>For the purpose of: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, and/or having excessive reclamation challenges.</p> <p>If circumstances or relative resource values change or if the lessee demonstrates that operations can be conducted without causing unacceptable impacts, this stipulation may be excepted, modified or waived by the Authorized Officer if such action is consistent with the provisions of the applicable land use plan, or if not consistent through a planning amendment. An exception, modification, or waiver of this stipulation will require compliance with the National Environmental Policy Act and may be subject to a 15-day public review period. Any changes to this stipulation will be made in accordance with the land use plan and/or regulatory provisions for such changes. (For guidance on the use of this stipulation, see Bureau of Land Management Manuals 1624 and 3101 or Forest Service Manuals 1950 and 2820).</p> <p>The following is the criteria for exceptions, modifications and waivers:</p> <p>Exception: The authorizing officer may grant an exception to this condition for short distances (less than 300 feet and 10% in grade) for access roads if the operator submits a certified engineering and reclamation plan that clearly demonstrates impacts from the proposed actions are acceptable or can be adequately mitigated. This plan must include and demonstrate how the following will be accomplished:</p> <ul style="list-style-type: none"> - Restoration of site. - Adequate control of surface runoff. - Protection of the site and adjacent areas from accelerated erosion, such as drilling, gullying, piping, and slope failure and mass wasting. - Protection of nearby water sources from sedimentation. Water quality and quantity will be in conformance with state and Federal water quality standards.

Table 7.2. List of Lease Stipulations

STIPULATION	DESCRIPTION/PURPOSE
	<p>- Completion of site-specific analysis of soil physical, chemical and mechanical (engineering) properties and behavior.</p> <p>- Timing of surface-disturbing activities these activities will not be conducted during extended wet periods.</p> <p>- Timing of reclamation as reclamation will not be allowed when soils are frozen.</p> <p>In addition, the operator must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions.</p>
NM-1-LN	<p>LEASE NOTICE – POTENTIAL, SUITABLE AND OCCUPIED HABITAT FOR SPECIAL STATUS PLANT SPECIES</p> <p>The lease contains potential, suitable and/or occupied habitat for special status plant species; therefore, special status plant species clearance surveys may be required prior to approving any surface disturbing activities within or adjacent to BLM Special Status Plant Species' potential, suitable and occupied habitats.</p> <p>Survey requirements would include the following:</p> <ul style="list-style-type: none"> • Clearance surveys must be conducted by a qualified botanist as determined the BLM. • The area to be surveyed will include at a minimum the project area plus an additional 100 meters outside the project area. • Clearance surveys will be conducted during the blooming season or the period in which the plant species is most easily detected as determined by the BLM. <p>Based on the results of the survey, conditions of approval may be applied to land use authorizations and permits that fall within the area of direct/indirect impacts or affected habitat, as appropriate. Possible mitigation strategies may include, but are not limited to:</p> <ul style="list-style-type: none"> • Avoidance/restriction of development such as locating the surface disturbance area away from the edge of occupied or suitable habitat and ideally outside of the area where indirect/direct impacts would occur; • Minimizing the area of disturbance utilizing strategies such as but not limited to twinning, and utilizing existing disturbance and corridors; • Dust abatement measures; • Signs, fencing, and other deterrents to reduce human disturbance; • Construction of well sites, roads and associated facilities outside of the blooming season; • Specialized reclamation procedures such as, but not limited to, <ul style="list-style-type: none"> ○ separating soil and subsoil layers with barriers to reclaim in the correct order, ○ using a higher percentage of forbs in the reclamation seed mix to promote pollinator habitat, ○ collection of seeds for sensitive plant species' genetic preservation, grow-out, and reclamation; • Long term monitoring of indirect/direct impacts on the species and/or habitat; • Qualified, independent third-party contractors to provide general oversight and assure compliance with project terms and conditions during construction; • Non-native or invasive species monitoring and control in occupied and suitable habitat; • Any other on-site habitat protection or improvements, known by best available science to be beneficial.

Table 7.2. List of Lease Stipulations

STIPULATION	DESCRIPTION/PURPOSE
NM-11- LN	<p>LEASE NOTICE – CULTURAL RESOURCES</p> <p>All development activities proposed under the authority of this lease are subject to compliance with Section 106 of the NHPA and Executive Order 13007. The lease area may contain historic properties, traditional cultural properties (TCP's), and/or sacred sites currently unknown to the BLM that were not identified in the Resource Management Plan or during the lease parcel review process. Depending on the nature of the lease developments being proposed and the cultural resources potentially affected, compliance with Section 106 of the National Historic Preservation Act and Executive Order 13007 could require intensive cultural resource inventories, Native American consultation, and mitigation measures to avoid adverse effects—the costs for which will be borne by the lessee. The BLM may require modifications to or disapprove proposed activities that are likely to adversely affect TCP's or sacred sites for which no mitigation measures are possible. This could result in extended time frames for processing authorizations for development activities, as well as changes in the ways in which developments are implemented.</p>
WO-ESA-7	<p>ENDANGERED SPECIES ACT- SECTION 7 CONSULTATION STIPULATION</p> <p>The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground- disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 USC. 1531 et seq., including completion of any required procedure for conference or consultation.</p>
WO-NHPA	<p>CULTURAL RESOURCES AND TRIBAL CONSULTATION STIPULATION</p> <p>This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.</p>

7.4. Appendix D – Phases of Oil and Gas Development

7.4.1. Construction Activities

Clearing of the proposed well pad and access road would be limited to the smallest area possible to provide safe and efficient work areas for all phases of construction. First all new construction areas need to be cleared of all vegetation. All clearing activities are typically accomplished by cutting, mowing and/or grading vegetation as necessary. Cut vegetation may be mulched and spread on site or hauled to a commercial waste disposal facility.

Next, heavy equipment including but not limited to bulldozers, graders, front-end loaders, and/or track hoes are used to construct at a minimum the pad, but other features, as needed for development, may include, but is not limited to an access road, reserve pit, pipeline, and/or fracturing pond. Cut and fills may be required to level the pad or road surfaces. If a reserve pit is authorized, it would be lined using an impermeable liner or other lining mechanism (i.e. bentonite or clay) to prevent fluids from leeching into the soil. Access roads may have cattle guards, gates, drainage control, or pull-outs installed, among a host of other features that may be necessary based on the site specific situation. Long-term surfaces are typically dressed with a layer of crushed rock or soil cemented. Construction materials come from a variety of sources. Areas not needed for long-term development (i.e. portions of the pipeline or road right-of-way) are reclaimed by recontouring the surface and establishing vegetation.

If a pipeline is needed, the right-of-way would be cleared of all vegetation. The pipeline would be laid out within the cleared section. A backhoe, or similar piece of equipment, would dig a trench at least 36 inches below the surface. After the trench is dug, the pipes would be assembled by welding pieces of pipe together and bending them slightly, if necessary, to fit the contour of the pipeline's path. Once inspected, the pipe can be lowered into the trench and covered with stockpiled subsoil that was originally removed from the hole. Each pipeline undergoes hydrostatic testing prior to natural gas being pumped through the pipeline. This ensures the pipeline is strong enough and absent of any leaks.

7.4.2. Drilling Operations

When the pad is complete, the drilling rig and associated equipment would be moved onsite and erected. A conventional rotary drill rig with capability matched to the depth requirements of the proposed well(s) would be used. The well could be drilled as a vertical or horizontal well to target the desired formation. The depth of the well is entirely dependent on the target formation depth and could be several hundred feet vertical depth to over 20,000 feet vertical depth.

When a conventional reserve pit system is proposed, drilling fluid or mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the bore of the well, and finally to the surface. When mud emerges from the hole, it enters into the reserve pit where it would remain until all fluids are evaporated and the solids can be buried.

A closed-loop system, operates in a similar fashion except that when the mud emerges from the hole, it passes through a series of equipment used to screen and remove drill cuttings (rock chips) and sand-sized solids rather than going into the pit. When the solids have been removed, the mud would be placed into holding tanks, and from the tank, used again.

In either situation the mud is maintained at a specific weight and viscosity to cool the bit, seal off any porous zones (thereby protecting aquifers or preventing damage to producing zone productivity), control subsurface pressure, lubricate the drill string, clean the bottom of the hole, and bring the drill cuttings to the surface. Water-based or oil-based muds can be used and is entirely dependent on the site-specific conditions.

7.4.3. Completion Operations

Once a well has been drilled, completion operations would begin once crews and equipment are available. Well completion involves setting casing to depth and perforating the casing in target zones.

Wells are often treated during completion to improve the recovery of hydrocarbons by increasing the rate and volume of hydrocarbons moving from the natural oil and gas reservoir into the wellbore. These processes are known as well-stimulation treatments, which create new fluid passageways in the producing formation or remove blockages within existing passageways. They include fracturing, acidizing, and other mechanical and chemical treatments often used in combination. The results from different treatments are additive and complement each other.

7.4.4. Hydraulic Fracturing

Hydraulic fracturing (HF) is one technological key to economic recovery of oil and gas that might have been left by conventional oil and gas drilling and pumping technology. It is a formation stimulation practice used to create additional permeability in a producing formation, thus allowing gas to flow more readily toward the wellbore. Hydraulic fracturing can be used to overcome natural barriers, such as naturally low permeability or reduced permeability resulting from near wellbore damage, to the flow of fluids (gas or water) to the wellbore (Groundwater Protection Council 2009). The process is not new and has been a method for additional oil and gas recovery since the early 1900s; however, with the advancement of technology it is more commonly used.

Hydraulic fracturing is a process that uses high pressure pumps to pump fracturing fluid into a formation at a calculated, predetermined rate and pressure to generate fractures or cracks in the target formation. For shale development, fracture fluids are primarily water-based fluids mixed with additives which help the water to carry proppants into the fractures, which may be made up of sand, walnut hulls, or other small particles of materials. The proppant is needed to “prop” open the fractures once the pumping of fluids has stopped. Once the fracture has initiated, additional fluids are pumped into the wellbore to continue the development of the fracture and to carry the proppant deeper into the formation. The additional fluids are needed to maintain the downhole pressure necessary to accommodate the increasing length of opened fracture in the formation.

Hydraulic fracturing of horizontal shale gas wells is performed in stages. Lateral lengths in horizontal wells for development may range from 1,000 feet to more than 5,000 feet. Depending on the lengths of the laterals, treatment of wells may be performed by isolating smaller portions of the lateral. The fracturing of each portion of the lateral wellbore is called a stage. Stages are fractured sequentially beginning with the section at the farthest end of the wellbore, moving uphole as each stage of the treatment is completed until the entire lateral well has been stimulated.

This process increases the flow rate and volume of reservoir fluids that move from the producing formation into the wellbore. The fracturing fluid is typically more than 99% water and sand, with small amounts of readily available chemical additives used to control the chemical and mechanical properties of the water and sand mixture (see discussion about Hazardous and Solid Wastes below).

Because the fluid is composed mostly of water, large volumes of water are usually needed to perform hydraulic fracturing. However, in some cases, water is recycled or produced water is used.

Chemicals serve many functions in hydraulic fracturing, from limiting the growth of bacteria to preventing corrosion of the well casing. Chemicals are needed to insure the hydraulic fracturing job is effective and efficient. The fracturing fluids used for shale stimulations consist primarily of water but also include a variety of additives. The number of chemical additives used in a typical fracture treatment varies depending on the conditions of the specific well being fractured. A typical fracture treatment will

use very low concentrations of between three and 12 additive chemicals depending on the characteristics of the water and the shale formation being fractured. Each component serves a specific, engineered purpose. The predominant fluids currently being used for fracture treatments in the shale gas plays are water-based fracturing fluids mixed with friction-reducing additives, also known as slickwater (Groundwater Protection Council 2009).

The make-up of fracturing fluid varies from one geologic basin or formation to another. Because the make-up of each fracturing fluid varies to meet the specific needs of each area, there is no one-size-fits-all formula for the volumes for each additive. In classifying fracture fluids and their additives it is important to realize that service companies that provide these additives have developed a number of compounds with similar functional properties to be used for the same purpose in different well environments. The difference between additive formulations may be as small as a change in concentration of a specific compound (Groundwater Protection Council 2009).

Typically, the fracturing fluids consist of about 99% water and sand and about 1% chemical additives. The chemical additives are essential to the process of releasing gas trapped in shale rock and other deep underground formation.

Some soils and geologic formations contain low levels of radioactive material. This naturally occurring radioactive material (NORM) emits low levels of radiation, to which everyone is exposed on a daily basis. When NORM is associated with oil and natural gas production, it begins as small amounts of uranium and thorium within the rock. These elements, along with some of their decay elements, notably Radium-226 and Radium-228, can be brought to the surface in drill cuttings and produced water. Radon-222, a gaseous decay element of radium, can come to the surface along with the shale gas. When NORM is brought to the surface, it remains in the rock pieces of the drill cuttings, remains in solution with produced water, or, under certain conditions, precipitates out in scales or sludges. The radiation is weak and cannot penetrate dense materials such as the steel used in pipes and tanks.

Before operators or service companies perform a hydraulic fracturing treatment, a series of tests are performed. These tests are designed to ensure that the well, casing, well equipment, and fracturing equipment are in proper working order and would safely withstand the application of the fracture treatment pressures and pump flow rates.

To ensure that hydraulic fracturing is conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance on Federal public lands. Operators must submit Applications for Permit to Drill (APDs) to the agency. Prior to approving an APD, a BLM Field Office geologist identifies all potential subsurface formations that would be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures.

Once the geologic analysis is completed, the BLM reviews the company's proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist and all known or anticipated zones with potential risks.

During drilling, the BLM is on location during the casing and cementing of the groundwater protective surface casing and other critical casing and cementing intervals. Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation. If the fracturing of the well is considered to be a "non-routine" fracture for the area, the BLM would always

be onsite during those operations as well as when abnormal conditions develop during the drilling or completion of a well.

7.4.5. Production Operations

Production equipment used during the life of the well may include a three-phase separator-dehydrator; flow-lines; a meter run; tanks for condensate, produced oil, and water; and heater treater. A pump jack may be required if the back pressure of the well is too high. Production facilities are arranged to facilitate safety and maximize reclamation opportunities. All permanent aboveground structures not subject to safety considerations are painted a standard BLM environmental color or as landowner specified.

Workovers may be performed multiple times over the life of the well. Because gas production usually declines over the years, operators perform workover operations which involve cleaning, repairing, and maintaining the well for the purposes of increasing or restoring production.

Anticipated use or produced hazardous materials during the development may come from drilling materials; cementing and plugging materials; HF materials; production products (natural gas, condensates, produced water); fuels and lubricants; pipeline materials; combustion emissions; and miscellaneous materials. Table 7.3 includes some of the common wastes (hazardous and nonhazardous) that are produced during oil and gas development.

Table 7.3. Common Wastes Produced During Oil and Gas Development

PHASE	WASTE	
Construction	Domestic wastes (i.e. food scraps, paper, etc.)	
	Excess construction materials	Woody debris
	Use lubricating oils	Paints
	Solvents	Sewage
	Drilling muds, including additives (i.e. chromate and barite) and cuttings; Well drilling g, completion, workover, and stimulation fluids (i.e. oil derivatives such as polycyclic aromatic hydrocarbons (PAHs), spilled chemicals, suspended and dissolved solids, phenols, cadmium, chromium, copper, lead, mercury, nickel)	
	Equipment, power unit and transport maintenance wastes (i.e. batteries; used filters, lubricants, oil, tires, hoses, hydraulic fluids; paints; solvents)	
	Fuel and chemical storage drums and containers	
	Cementing wastes	Rigwash
	Production testing wastes	Excess drilling chemicals
	Excess construction materials	Processed water
	Scrap metal	Contaminated soil
	Sewage	Domestic wastes
Hydraulic Fracturing	See below	
Production	Power unit and transport maintenance wastes (i.e. batteries; used filters, lubricants, filters, tires, hoses, coolants, antifreeze; paints; solvents, used parts)	

Table 7.3. Common Wastes Produced During Oil and Gas Development

PHASE	WASTE
	Discharged produced water
	Production chemicals
	Workover wastes (e.g. brines)
Abandonment /Reclamation	Construction materials
	Decommissioned equipment
	Contaminated soil

7.5. Appendix E – Social Cost of Carbon

A protocol to estimate what is referenced as the “social cost of carbon” (SCC) associated with GHG emissions was developed by a federal Interagency Working Group (IWG) to assist agencies in addressing Executive Order (EO) 12866, which requires federal agencies to assess the cost and the benefits of proposed regulations as part of their regulatory impact analyses. The SCC is an estimate of the economic damages associated with an increase in carbon dioxide emissions and is intended to be used as part of a cost-benefit analysis for proposed rules. As explained in the Executive Summary of the 2010 SCC Technical Support Document “the purpose of the [SCC] estimates...is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO₂) emissions into cost-benefit analyses of regulatory actions that have small, or ‘marginal,’ impacts on cumulative global emissions.” Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 February 2010 (withdrawn by EO13783). While the SCC protocol was created to meet the requirements for regulatory impact analyses during rulemakings, there have been requests by public commenters or project applicants to expand the use of SCC estimates to project-level NEPA analyses.

The decision was made not to expand the use of the SCC protocol for this lease sale EA for a number of reasons. Most notably, this action is not a rulemaking for which the SCC protocol was originally developed. Second, on March 28, 2017, the President issued Executive Order 13783 which, among other actions, withdrew the Technical Support Documents upon which the protocol was based and disbanded the earlier Interagency Working Group on Social Cost of Greenhouse Gases. The Order further directed agencies to ensure that estimates of the social cost of greenhouse gases used in regulatory analyses “are based on the best available science and economics” and are consistent with the guidance contained in OMB Circular A-4, “including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates” (E.O. 13783, Section 5(c)). In compliance with OMB Circular A-4, interim protocols have been developed for use in the rulemaking context. However, the Circular does not apply to project decisions, so there is no Executive Order requirement to apply the SCC protocol to project decisions.

Further, the National Environmental Policy Act (NEPA) does not require a cost-benefit analysis (40 C.F.R. § 1502.23), although NEPA does require consideration of “effects” that include “economic” and “social” effects. 40 C.F.R. 1508.8(b). Without a complete monetary cost-benefit analysis, which would include the social benefits of the proposed action to society as a whole and other potential positive benefits, inclusion solely of an SCC cost analysis would be unbalanced, potentially inaccurate, and not useful in facilitating an authorized officer’s decision. Any increased economic activity, in terms of revenue, employment, labor income, total value added, and output, that is expected to occur with the proposed action is simply an economic impact, rather than an economic benefit, inasmuch as such impacts might be viewed by another person as negative or undesirable impacts due to potential increase in local population, competition for jobs, and concerns that changes in population will change the quality of the local community. Economic impact is distinct from “economic benefit” as defined in economic theory and methodology, and the socioeconomic impact analysis required under NEPA is distinct from cost-benefit analysis, which is not required.

Finally, the SCC protocol does not measure the actual incremental impacts of a project on the environment and does not include all damages or benefits from carbon emissions. The SCC protocol estimates economic damages associated with an increase in carbon dioxide emissions - typically expressed as a one metric ton increase in a single year - and includes, but is not limited to, potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years. The estimate is developed by aggregating results “across models, over time, across regions and impact categories, and across 150,000 scenarios” (Rose et al. 2014). The dollar cost

figure arrived at based on the SCC calculation represents the value of damages avoided if, ultimately, there is no increase in carbon emissions. But the dollar cost figure is generated in a range and provides little benefit in assisting the authorized officer's decision for project level analyses. For example, in a recent environmental impact statement, OSM estimated that the selected alternative had a cumulative SCC ranging from approximately \$4.2 billion to \$22.1 billion depending on dollar value and the discount rate used. The cumulative SCC for the no action alternative ranged from \$2.0 billion to \$10.7 billion. Given the uncertainties associated with assigning a specific and accurate SCC resulting from the proposed lease sale, and that the SCC protocol and similar models were developed to estimate impacts of regulations over long time frames, this EA quantifies direct and indirect GHG emissions and evaluates these emissions in the context of U.S. and State/County GHG emission inventories as discussed in Section 3.5 of the EA.

To summarize, this EA does not undertake an analysis of SCC because: 1) it is not engaged in a rulemaking for which the protocol was originally developed; 2) the IWG, technical supporting documents, and associated guidance have been withdrawn; 3) NEPA does not require cost-benefit analysis; and 4) the full social benefits of oil and gas production have not been monetized, and quantifying only the costs of GHG emissions but not the benefits would yield information that is both potentially inaccurate and not useful.